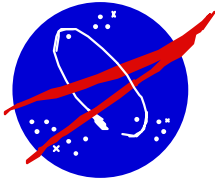


GROUND NETWORK PROJECT

ADEOS-II NASA/NOAA Ground Network (NGN) Integration & Test Plan

Version 3.0

June 21, 2001



National Aeronautics and
Space Administration

Goddard Space Flight Center

Wallops Flight Facility

Wallops Island, Virginia 23337

ADEOS-II NASA/NOAA Ground Network (NGN) Integration & Test Plan

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Preface

The National Space Development Agency (NASDA) of Japan, the National Aeronautics and Space Administration (NASA) of the United States of America, and the National Oceanic and Atmospheric Administration (NOAA) of the United States of America are cooperating on the Advanced Earth Observing Satellite-II (ADEOS-II) Program. Current launch date is November 2001 from the Tanegashima Space Center, Japan.

According to the signed Memorandum of Understanding between the two governments: NASA, using reasonable efforts as stated in the appropriate documentation, is to capture data, obtainable within NASA's resource limitations and ADEOS-II's operational constraints, from the ADEOS-II sensors with NASA-provided facilities and make these data available to NASDA and NOAA while meeting agreed data latency goals.

The ADEOS-II mission consists of a single sun-synchronous satellite equipped with two core earth observing NASDA sensors and three sensors provided by NASA and Centre National d'Etudes Spatiales (CNES). The system will make use of U.S. ground stations located at the Wallops Flight Facility (WFF), Wallops Island, Virginia and the Alaska SAR Facility, Fairbanks, Alaska.

The primary objective of the ADEOS-II NGN Integration and Test plan is to document the testing methodology used to verify the readiness of the NGN ground systems elements identified to support the ADEOS-II mission

Appreciation is expressed to the entire NGN Team for the collaborative effort in the creation of this test plan.

Comments are welcome; send to:

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Document Change History

Revision	Effective Date	Description of Changes
Version 1.0	12/01/00	Initial Release.
Version 2.0	04/01/01	Updated Test Procedures and Signature Page.
Version 3.0	06/15/01	Addition of Network Connectivity Test (Section 5.1). Removed specific site designation from tests that may be conducted during different time periods at various sites.

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1.0 Introduction

1.1 Purpose

The ADEOS-II mission is unprecedented in scope regarding global acquisition and distribution of near-realtime data to multiple users using a highly automated ground network.

The goal of the NASA/NOAA Ground Network (NGN) Integration and Test Plan is repeated exercise of full end-to-end functionality of the NGN, from scheduling interface to data delivery. The testing process will ensure integration of major building blocks in an orderly manner. The end product will be an integrated system of hardware, software, and procedures that is robust enough to support routine ADEOS-II operations. The overall system integration will demonstrate the ability to meet stated requirements.

Success will be measured by timeliness of data delivery, efficient recovery from anomaly or perturbation, and demonstration of reliability. Final evaluation of system performance, adherence to requirements, and readiness for routine operations will be provided externally by formal review before peers.

1.1.1 Joint vs. Internal Testing

The NASDA/NASA/NOAA MOU states: “NASDA shall provide overall coordination and direction for the ADEOS-II program...”. To this end, NASDA has provided the Mission Simulation Test Plan (MSTP) that is the core document for joint testing. The NGN will support the MSTP, and augment the MSTP with additional internal testing defined in this document.

NGN Support of MSTP

- a. Preparation
 - 1. Documentation (including this document, exchange of procedures)
 - 2. Organizational structure
- b. Ensure preparations for individual MSTP test activities
 - 1. Pre-test rehearsals
 - 2. Procedures
 - 3. Materials
 - 4. Documentation

Augmentation of MSTP

- a. Meet additional NASA/NOAA functional and performance requirements

1. Fail-over (contingency)
 2. Derived requirements
 3. Demonstrate robustness at all levels of system/sub-system
 4. Network “soak” testing
- b. Meet additional NASA Mission Readiness requirements
1. Operational rehearsals (demonstrate proficiency)
 2. Support formal management reviews through Launch Readiness (includes sparing)
- c. Transition from engineering to operations
1. WFF: NASA engineering codes 584 and 567 to operations contractor
 2. ASF: Via existing grant or subcontract

1.2 Scope

This NGN Integration and Test Plan is intended to provide structure for the management, documentation, execution, evaluation, and schedule of pre-launch ADEOS-II ground system testing, applicable to the following test elements:

- | | |
|------------|--|
| a. ASF | prime data acquisition site (10-14 passes/day) |
| b. WFF | secondary acquisition site (3-4 passes/day) |
| c. SeaPAC | data user |
| d. NOAA | data user |
| e. EOSDIS | data distribution network |
| f. PO.DAAC | data archival and distribution |

1.3 Applicable Documents and References

NGN Documents

See "<http://www.wff.nasa.gov/~adeos/>" for current on-line ADEOS-II NGN information including:

- a. ADEOS-II NGN WFF Program/Project Plan
- b. ADEOS-II NGN WFF Functional Requirements Document
- c. SAFS Product Plan

ASF Documents

- a. ADEOS-II Ground Segment Functional Requirements Document, ASF-99-REQ106-1.0
- b. ADEOS-II Ground Segment Functional Design Document, ASF-99-REQ109-1.0

NASDA Documents

- a. Memorandum of Understanding between NASDA, NASA and NOAA for cooperation in ADEOS-II Program.
- b. ADEOS-II to Ground Station Interface Document, AD2-EOC-96-123.
- c. ADEOS-II Ground System Interface Requirements Document (NASDA/NASA/NOAA), AD2-EOC-95-056.
- d. ADEOS-II Mission Operations Interface Specification (NASDA/NASA/NOAA), AD2-EOC-97-046
- e. ADEOS-II Mission Operations Interface Specification (Common Part), AD2-EOC-96-054
- f. ADEOS-II Mission Operations Implementation Plan (NASDA/NASA/NOAA), AD2-EOC-96-055
- g. ADEOS-II Mission Simulation Test Plan, AD2-EOSD-99-012.
- h. Format Description of Mission Operation Information Files (NGN), AD2-EOSD-98-155.
- i. ADEOS-II Network Communications Interface Requirements Document (NASDA-NASA/NOAA), EOIS/AII-ND-008.
- j. Level 0 Format Description for:
 - 1. GLI 1km, AD2-EOSD-98-011
 - 2. AMSR, AD2-EOC-96-122
 - 3. SeaWinds, AD2-EOC-96-119
 - 4. ADEOS-II/ARGOS DCS, AD2-EOC-97-044
 - 5. LAS-II, AD2-EOC-96-121
 - 6. TEDA, AD2-EOC-97-003
 - 7. VMS, AD2-EOSD-98-146
 - 8. DMS(1&2), AD2-EOSD-98-147
 - 9. HK TLM Packet, AD2-EOSD-97-012

Scientific Atlanta Documents

- a. Data Stripper Controller User's Manual, 7 March 2000.
- b. Data Stripper Controller & Master Controller Test Plan. 11 June 1999.

2.0 Test Methodology

2.1 Testing Approach

The NGN has developed a specific approach to be used in the testing of the NASA/NOAA Ground System. The fundamental approach is to insure Ground Systems requirements are documented, to identify where system requirements are levied on individual elements of the ground system, to develop test procedures that can be used to verify the requirements are met, and subsequently to certify mission readiness during a formal period of Ground System Integration and Testing (I&T). Ground Systems I&T is conducted to verify that all end-to-end systems, interfaces, and operations elements meet the mission requirements. These integrated systems verification tests are conducted prior to the project spacecraft-to-ground operational compatibility.

2.2 Planning and Analysis

The set of tests that will be performed during the I&T phase were developed during the planning and analysis phase. The NGN ADEOS-II Project compiled a database of requirements from which test objectives and requirements were generated. This database was used to create tests that were then cross-checked on an NGN Requirements Versus Test Matrix table. The Requirements Versus Test Matrix table appears in section 6.

2.3 Integration and Test

Following the acceptance testing of the Ground System elements, initial interface testing between the Ground System elements is accomplished. After all elements have completed acceptance and interface testing, the ADEOS-II NGN Ground System I&T will begin.

During the ADEOS-II NGN I&T, a set of integrated tests will be performed to verify that the ADEOS-II NGN Ground System can support all ADEOS-II NGN Mission Support Requirements contained in the ADEOS-II Detailed Mission Requirements (DMR) document. The I&T phase will:

- a. Verify that all ADEOS-II NGN Ground System interfaces support each specific ADEOS-II NGN mission function identified in the ADEOS-II DMR.
- b. Verify the capability of the ADEOS-II NGN Ground System to support all ADEOS-II NGN mission requirements.
- c. Demonstrate the operational readiness of the ADEOS-II NGN Ground System to support all ADEOS-II NGN required mission activities.

2.4 Evaluation

A Test Review Board (TRB) has been established for each ground station site (WGS and ASF) to review procedures prior to testing, and to evaluate test results and discrepancies. Each TRB consists of the ADEOS-II NGN Project Manager, the ADEOS-II NGN Integration and Test Manager, the Systems Assurance Manager, and the site Operations Manager. Element Representatives will be asked to participate as needed for a specific test.

All tested requirements will be tracked as being either not verified, partially verified, or fully verified. All Ground System discrepancies will be documented for follow-up and resolution. A TRB will prioritize discrepancies and determine if any can be waived or deleted, or if mission requirements can be supported with a reliable work around. Once all the requirements are fully verified, and all relevant discrepancies are resolved, the ADEOS-II NGN Ground System verification I&T process is complete.

3.0 Test Management

3.1 Overview

This section defines the ADEOS-II NGN Test Management Team (TMT) organization. It also defines the basic responsibilities of the participating Mission Readiness Test Team personnel required to accomplish the defined ADEOS-II NGN test activities.

3.2 Test Management Team Organization

The ADEOS-II NGN TMT organization is shown in Figure 3.2-1. The TMT is composed of representatives from each of the supporting system elements under the direction of the Project Manager (PM). The element representatives are responsible for completing the acceptance of their respective elements, and initial interface testing between elements prior to the start of I&T. The TMT then collectively implements the Ground System I&T Plan.

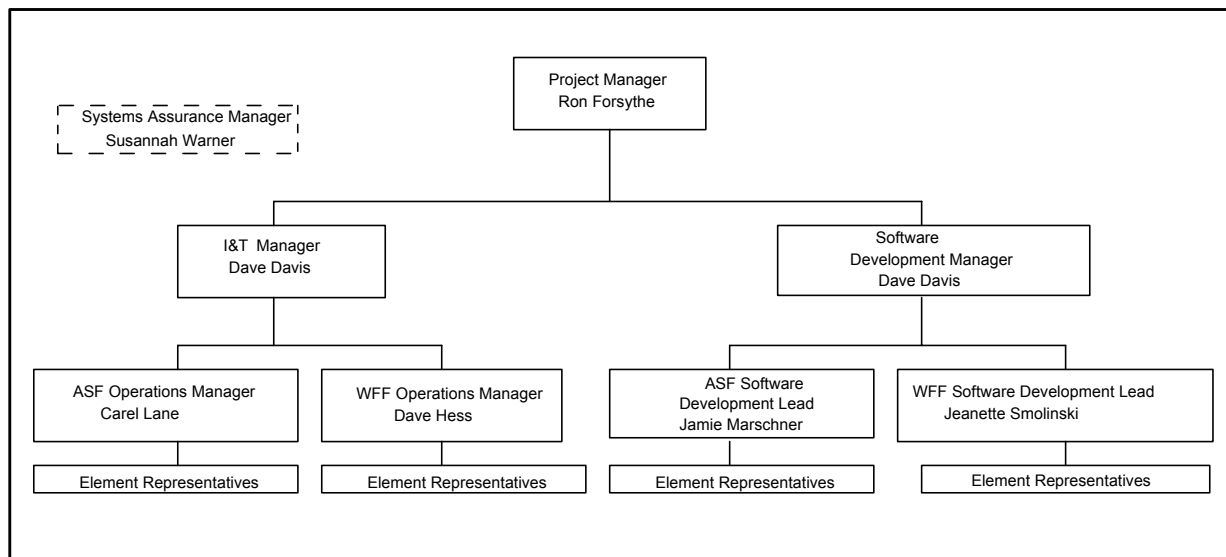


Figure 3.2-1 – ADEOS-II NGN Test Management Team Organization

3.3 TMT Roles and Responsibilities

Specific roles and responsibilities of some of the TMT representatives are as follows:

- a. Integration and Test Manager (I&TM): The ADEOS-II NGN I&TM has overall responsibility for verifying that all ADEOS-II NGN Ground System elements are ready to support all phases of the ADEOS-II NGN mission. Specifically, the I&TM will:
 1. Function as the ADEOS-II NGN Ground System focal point for all project test requirements.
 2. Develop, coordinate, and maintain the Ground System I&T schedule in conjunction with the Operations Manager.
 3. Provide element and project test coordination support as necessary.
 4. Conduct post test critiques.
 5. Assess discrepancies and their resolution.
 6. Assess overall data system readiness.
 7. Interface with NASDA where coordinated NASDA/NASA testing is being performed.
- b. Operations Manager (OM): The OM's are the prime test support personnel supporting the I&TM for the ADEOS-II NGN mission. The OM's assist the I&TM in all testing activities. Specifically the OM's will:
 1. Analyze mission requirements and test plans.
 2. Obtain detailed test instructions and confirm their correctness.
 3. Assess the site readiness to support the test, including the impact of any degraded configuration (equipment, software, etc.).
 4. Identify the Test Director (TD) for each test.
 5. Schedule equipment and personnel required to support each test.
 6. Be responsible for correction of operational discrepancies.
 7. Establish estimated time to correct operational discrepancies.
 8. Confirm the correction of element discrepancies.
- c. Element Representative (ER): The ER's have overall responsibility for the readiness of their element to participate in the test and simulation activities. Specifically the ER's will:
 1. Analyze mission requirements and test plans relative to their element
 2. Be responsible for test instructions for their element.
 3. Be responsible for the readiness of their element to participate in test activities.
 4. Work with the OM to identify the element Test Coordinator (TC) for each test.
 5. Be responsible for correction of discrepancies for their element.
 6. Provide the estimated time to clear or correct discrepancies for their element.
 7. Provide status information relative to any discrepancies for their element.
- d. The Systems Assurance Manager (SAM): The SAM supports the TMT as a member in an independent quality assurance role. The SAM will track the test results and the resolution of discrepancies, and provide status and metrics data as requested by the I&TM or PM. Specifically the SAM will:
 1. Monitor discrepancies and their resolution.
 2. Provide discrepancy information to the I&TM.
 3. Receive test reports and disseminate results.

4. Maintain a central collection point for test reports, test logs, and test data.
5. Track the requirements scheduled and verified per test.
6. Provide status data and reports as requested.
7. Provide metrics data and reports as requested.

3.4 Test Teams

A test team will be formed for each test consisting of a Test Director (TD) and one or more Test Coordinators (TC). The I&TM will coordinate with the TD or Network Operations Manager (NOM) who will exercise overall test authority and be responsible for verifying the specified test objectives. The TD will identify the TCs who will be responsible the execution of the assigned tests for their element.

- a. Test Director (TD): The TD or NOM for a given test is identified by the site OM. Specifically, the TD will:
 1. Prepare a consolidated test script
 2. Conduct a pretest briefing for all personnel involved in the test, concentrating on reviewing functions to be verified during the course of the test.
 3. Verify test configuration and interfaces.
 4. Conduct the test: Evaluate overall test progress/results and determine the proper course of action in regard to cancellation, continuation, or modification of remaining test activity. Ensure proper data collection for subsequent analysis.
 5. Conduct the test debriefing: Identify all problem areas. Identify and correct test procedure errors.
 6. Collect all test reports, test logs, test data, and test discrepancies. Forward to the SAM.
 7. Prepare a consolidated readiness report. Forward to the SAM.
- b. Element Test Coordinators (TC): The element TCs for a given test are assigned by the ERs. Specifically, each element TC will:
 1. Participate in the pretest briefing, concentrating on element functions to be verified during the course of the test.
 2. Ensure proper test configuration and interface for their element.
 3. Participate in testing of their element: Evaluate overall test progress/results for their element and advise the TD in regard to cancellation, continuation, or modification of remaining test activity. Ensure proper data collection for subsequent analysis. Forward to the TD.
 4. Participate in the test debriefing: Identify element problem areas. Identify and correct element test procedure errors.
 5. Prepare or collect element test reports, test logs, test data, and test discrepancies. Forward to the TD.
 6. Prepare element readiness report. Forward to the TD.

3.5 Test Evaluation and Discrepancy Resolution

All ADEOS-II NGN test discrepancy and resolution information will be monitored through the end of the mission life to assure that the non-conformance reporting and corrective action process is a closed loop, and that problems with any baselined products are corrected. A test discrepancy report should be generated when the performance of a system function being verified during a test does not meet the project-specified requirement. ASF and WGS (CSOC) will use their own internal configuration management processes to track and correct discrepancies.

4.0 NGN Requirements

4.1 NGN High Level Requirements

According to the Memorandum of Understanding (MOU) between the United States and Japan for the ADEOS-II spacecraft, the NASA/NOAA Ground Network is to provide acquisition support and some Level 0 data processing for the life of the mission. This section summarizes the high level requirements. The requirements are detailed and numbered in section 4.2.

For the ADEOS-II mission operations related to NASDA, the NGN will provide the following support:

- a. Exchange mission operation information with NASDA and coordinate its station operation plan.
- b. Acquire ADEOS-II raw data via X1 and X3 band downlinks.
- c. Ship raw data acquired at the stations via X1 band to EOC using ID-1 tape.
- d. Generate some Level 0 data from MDR data and MRT data, and send them to EOC, SeaPAC and NOAA via electronic file transfer.
- e. Archive the raw data acquired at each facility and the Level 0 data processed for limited period of time.
- f. Support NASDA in ADEOS-II testing before launch, and in anomaly resolution after launch.

This support will be accomplished by satisfying these high level requirements:

Data Acquisition

- a. Mode 1 - Acquire ADEOS-II Mission data using X-band downlinks. (GLI 250m data from the X1 band, MRT data from the X3 band)
- b. Mode 2 - Acquire ADEOS-II Mission data using X-band downlinks (MDR data, GLI 250m data and ODR data from the X1 band, MRT data from the X3 band)

Data Processing

- a. Mode 1 - Process Raw data of MRT to Level 0 data of VMS/Real, DMS(1&2)/Real and DCS/Real and selected GLI 1km.
- b. Mode 2 -
 1. Process Raw data of MDR to Level 0 data of ILAS-II, AMSR, VMS/MDR, DMS(1&2)/MDR, TEDA and DCS/MDR, SeaWinds and selected GLI 1km.
 2. Process Raw data of MRT to Level 0 data of VMS/Real, DMS(1&2)/Real and DCS/Real and selected GLI 1km.
 3. Process Raw data of MDR to HK TLM source packet.

Data Storage

- a. Archive ADEOS-II raw data temporarily for up to 30 days until receiving the readability good report of the raw data.
- b. Archive Level 0 data and HK TLM source packet for period of 24 hours after data acquisition.

Data Distribution and Retrieval

- a. Mode 1 -
 - 1. Provide the Level 0 data of VMS/Real, DMS(1&2)/Real and DCS/Real to EOC by electronic file transfer.
 - 2. Provide the Level 0 data of DCS/Real and selected GLI 1km to NOAA/NESDIS by electronic file transfer.
 - 3. Provide the GLI 250m raw data to EOC by D1 tape.
 - 4. Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.
 - 5. Provide the back-up D1 tape of GLI 250m raw data, when readability problem of primary D1 tape is reported from EOC.
- b. Mode 2 -
 - 1. Provide the Level 0 data of AMSR, ILAS-II, TEDA, VMS/Real/MDR, DMS(1&2)Real/MDR, DCS/Real, DCS/MDR and HK TLM source packet to EOC by electronic file transfer.
 - 2. Provide the MDR, GLI 250m and ODR Raw data to EOC by D1 tape.
 - 3. Provide the SeaWinds Level 0 data and HK source packet to SeaPAC by electronic file transfer.
 - 4. Provide the DCS/Real/MDR, SeaWinds and selected GLI 1km Level 0 data to NOAA by electronic file transfer.
 - 5. Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.
 - 6. Provide the back-up D1 tape of MDR, ODR and/or GLI 250m raw data, when readability problem of primary D1 tape is reported from EOC.

Testing

- a. Support the ADEOS-II Ground Segment and End-to-End Test Plan generation.
- b. Participate in ADEOS-II Ground Segment testing and End-to-End testing.

4.2 NGN Detailed Requirements

The requirements needed to support the ADEOS-II project at WFF and AGS are listed in Table 4.2-1 below. The five high level ADEOS-II requirements have been subdivided into lower level requirements, and then the following numbering scheme (Req #) has been adopted:

- 10000 Data Acquisition
 - 11000 Acquisition Scheduling
 - 12000 Raw Data Acquisition
 - 13000 Acquisition Reporting
- 20000 Data Processing

21000 Level 0 Data Processing
 22000 Level 0 Reporting
 30000 Data Distribution
 31000 Magnetic Media Distribution
 32000 Level 0 Data Distribution
 40000 Data Storage
 41000 Tape Storage
 42000 Level 0 Data & Status File Storage
 50000 Testing
 51000 NASDA System Testing
 52000 System Proficiency Testing

Every requirement is classified (Req in the table) as AD for ADEOS-II. Next, each requirement has been assigned to an element, as follows:

- a. WOTIS – WFF planning and scheduling system
- b. FAIF & APS – ASF planning and scheduling system
- c. DSC – Data Stripper Controller with the TSI Data Stripper
- d. SAFS – Station SAFS (WFF & ASF) and CSAFS (GSFC)
- e. ATS Controller– Master/Node system at WFF and ASF for 11m antenna control
- f. GS – All other elements of the WFF and ASF ground station, not listed above, including operations staff

Finally, in referencing the table, the following abbreviations are used to distinguish the parent documents:

- a. MOU - Memorandum or Understanding
- b. MOIS(IND) - ADEOS-II Mission Operations Interface Specification (NASDA/NASA/NOAA)
- c. MOIS(C) - ADEOS-II Mission Operations Interface Specification (Common Part)
- d. AGSID - ADEOS-II to Ground Station Interface Document
- e. AGSIRD - ADEOS-II Ground System Interface Requirements Document (NASDA/NASA/NOAA)
- f. MOIP - ADEOS-II Mission Operations Implementation Plan (NASDA/NASA/NOAA)
- g. MSTP - ADEOS-II Mission Simulation Test Plan.

Some requirements are not directly traceable to a NASDA document, and have been defined by the NASA/GSFC/WFF engineering staff. These are listed as NASA. Other requirements are formed as an extension of traceable requirements, particularly where certain processes must be accomplished before others can logically follow.

Table 4.2-1 – NGN Requirements Matrix

Functional Group: Data Acquisition**Functional Element: Acquisition Scheduling**

Req Class	Req #	Parent	Description	WFF Element	ASF Element
AD	11010	MOIS(N), Section 4.2	The NGN shall support the MOIF file interchange protocol consisting of a Data Ready Notification (DRN), FTP file get, followed by a Receipt Confirmation Notification (RCN) using EMSNet.	WOTIS	FAIF
AD	11020	MOIS(N), Section 6.2	NGN shall retrieve and process data acquisition requests and planning information from NASDA in the form of an REQR file via the MOIF Interface (Ref AD11010), with the format given in the MOIF Format Description Document.	WOTIS	FAIF
AD	11030	AGSIRD, Section 2.2.2	NGN shall be capable of scheduling acquisition requests for ADEOS-II support at the NASA/GN/WGS and the UAF/ASF.	WOTIS	APS
AD	11040	MOIS(C), Section 3.5.2.2	ASF shall support up to 11 passes per day (duration up to 12 minutes), and WFF shall support up to 4 passes per day (duration up to 12 minutes).	WOTIS	APS
AD	11050	MOIS(N), Section 6.2	The NGN shall produce a reply to a data acquisition request (REQR) in the form of an STGS file, with the format given in the MOIF Format Description Document.	WOTIS	FAIF
AD	11060	MOIS(N), Section 6.2	The STGS file shall be made available for retrieval by NASDA within one day of request (REQR) receipt via the MOIF Interface (Ref AD11010).	WOTIS	FAIF
AD	11070	AGSIRD, Section 4.3	The NGN may retrieve spacecraft status information from NASDA via the MOIF Interface (Ref AD11010) in the form of an STAD file, with the format given in the MOIF Format Description Document.	WOTIS	FAIF
AD	11080	MOIS(N), Section 6.2	The NGN shall retrieve and use predicted spacecraft orbital information from NASDA via the MOIF Interface (Ref AD11010) in the form of an Elyyyy file, where yyyy is a four-digit year, with the format given in the MOIF Format Description Document.	WOTIS	FAIF
AD	11090	MOIS(N), Section 6.2	The NGN shall retrieve and process an operational schedule update from NASDA in the form of a SHAQ file via the MOIF Interface (Ref AD11010), with the format given in the MOIF Format Description Document.	WOTIS	FAIF APS
AD	11100	MOIS(N), Section 6.2	The NGN shall retrieve Level 0 product processing request information from NASDA via the MOIF Interface (Ref AD11010) in the form of the LV0P file, per the MOIF Format Description Document.	WOTIS	FAIF
AD	11110	MOIS(N), Section 6.2	The NGN shall retrieve near-real-time (NRT) product processing request information from NASDA via the MOIF Interface (Ref AD11010) in the form of the RTIG file, per the MOIF Format Description Document.	WOTIS	FAIF
AD	11120	Derived	The NGN shall forward the LV0P and RTIG files to the Data Stripper Controller (DSC).	WOTIS	FAIF
AD	11130	NASA	The NGN shall keep a copy of all Acquisition Scheduling files for one month after scheduled supports are complete.	WOTIS	FAIF
AD	11140	MOIP, Section 3.7	The NGN, as directed by NASDA, shall act upon spacecraft anomalies on a best effort basis.	GS	GS
AD	11150	NASA	In the event of a scheduling failure within the ASF system, WFF shall be able to schedule the ASF 11m antenna via WOTIS and the backup ATS system at ASF.	WOTIS	ATS

Functional Group: Data Acquisition**Functional Element: Raw Data Acquisition**

Req Class	Req #	Parent	Description		
AD	12100	AGSID, Section 5.2	The NGN shall receive ADEOS-II downlink data via the RF Interface at X-band (8.15 and 8.25 GHz) in accordance with ADEOS-II to Ground Station Interface Document.	GS	GS
AD	12110	AGSID, Section 6	The NGN shall be capable of simultaneously receiving CCSDS packetized downlink data at 6 and 60 Mbps in accordance with ADEOS-II to Ground Station Interface Document.	GS	GS
AD	12120	AGSID, Section 5.2	The NGN shall receive, downconvert, and demodulate raw signal downlink data in accordance with ADEOS-II to Ground Station Interface Document.	GS	GS
AD	12130	AGSID, Section 4.3	When receiving downlink data in Mode 1, the NGN shall record GLI-250m and/or ODR raw data on Sony D1 cassette tape.	GS	GS
AD	12140	AGSID, Section 4.3	When receiving downlink data in Mode 2, the NGN shall record MDR, GLI-250m, and ODR raw data on Sony D1 cassette tape.	GS	GS
AD	12150	MOIS(N), Section 6.3	All data recorded shall be placed, simultaneously, on a primary (Main, as specified by NASDA) and backup (Reserve, as specified by NASDA) tape.	GS	GS
AD	12160	Derived	The NGN shall route raw signal data to the DS for Level 0 processing.	GS	GS

Functional Group: Data Acquisition**Functional Element: Acquisition Reporting**

Req Class	Req #	Parent	Description		
AD	13100	MOIS(N), Section 6.2	The NGN shall generate a summary of each ADEOS-II scheduled support in the form of an RERC and RERB file, upon support completion, with the format given in the MOIF Format Description Document.	WOTIS	HC
AD	13110	MOIS(N), Section 6.2	The RERC file shall be used to report information from the Primary (Main, as specified by NASDA) D1 cassette tape as specified in the MOIF Format Description Document.	WOTIS	HC
AD	13120	MOIS(N), Section 6.2	The RERB file shall be used to report information from the Backup (Reserve, as specified by NASDA) D1 cassette tape as specified in the MOIF Format Description Document.	WOTIS	HC
AD	13130	MOIS(N), Section 6.2	The RERC & RERB files shall be made available to NASDA after support completion via the MOIF Interface (Ref AD11010).	WOTIS	FAIF
AD	13140	NASA	The Bit Sync Lock & Unlock times shall be determined from the 11m Pass Log.	ATS	HC
AD	13150	NASA	Lock is defined as 3 successive instances of the value 1 in the Pass Log, after the earliest X band start time.	ATS	HC
AD	13160	NASA	Unlock is defined as 3 successive instances of the value 0 in the Pass Log, before the latest X band stop time.	ATS	HC

AD 13170	MOIS(C), Section 5.2.1	The Acquisition Status shall be calculated as a % from the supplied formula.	ATS	HC
AD 13180	MOIS(C), Section 5.2.1	The Acquisition Status shall be reported in the RERC/B files as (G)ood, (P)oor, (N)one according to the supplied formula.	WOTIS	HC
AD 13190	MOIS(C), Section 5.2.1	The recording Status shall be calculated according to the supplied formula. <<NEED FORMULA>>	ATS	HC
WF 13200	NASA	The status of a pass shall be reported in the standard ATS Pass Results File, including the TSI Data Stripper summary statistics.	ATS	
WF 13210	NASA	The TSI Data Stripper Quality & Accounting file shall be forwarded to WOTIS by the Master for distribution to customers.	WOTIS	
AD 13220	MOIS(C), Section 5.1.5	NGN may receive daily reports of recording results and acquisition status from NASDA via the MOIF Interface.	WOTIS	FAIF
AD 13230	NASA	The NGN shall keep a copy of all Acquisition Reporting files on disk or tape for one month.	WOTIS	FAIF
AD 13240	MOIP, Section 3.7	NGN will immediately report anomalies detected during data acquisition or Level 0 processing, in the form of a system anomaly report, to NASDA, NOAA, and SeaPAC by quickest practical means.	GS	GS
AD 13250	MOIP, Section 3.7	System anomaly reports shall briefly describe the nature of the problem, proposed resolution, and estimated duration.	GS	GS
AD 13260	MOIP, Section 3.7	NGN shall inform NASDA, NOAA, and SeaPAC when the system has regained complete or partial functionality.	GS	GS
AD 13270	NASA	In the event of a failure of the ASF scheduling and reporting system, WFF shall be capable of reporting on all supports scheduled by WFF and taken at ASF using the backup ATS system.	WOTIS	ATS

Functional Group: Data Processing

Functional Element: Level 0 Data Processing

Req Class	Req #	Parent	Description		
AD	21100	AGSIRD, Section 3.4	When receiving downlink data in Mode 1 or Mode 2, NGN shall process MRT data to DCS, VMS, DMS1, DMS2, and GLI-1km Level 0 data.	DSC	DSC
AD	21110	AGSIRD, Section 3.4	When receiving downlink data in Mode 2, NGN shall process MDR data to SeaWinds, DCS, ILAS-II, TEDA, VMS, DMS1, DMS2, AMSR, and GLI-1km Level 0 data as well as HK telemetry source packet data.	DSC	DSC
AD	21120	Derived	NGN shall be capable of processing into Level 0 products not less than 5.5 gigabytes of downlink data per orbit for a maximum of up to ten passes per day per ground station.	DSC	DSC
AD	21130	MOIS(C), Section 5.2.2	For each data file produced by the TSI data stripper, NGN shall produce a corresponding Level 0 Status file, according to the format specified in the ADEOS-II Project Ground Segment Format Descriptions.	DSC	DSC
AD	21140	Derived	In case of a failure of the primary or secondary TSI Data Stripper front-end, every attempt should be made to process the MDR data from the 60 Mbps data stream.	DSC	DSC
AD	21150	Derived	GLI-1km data shall be subset to NOAA areas of interest using S/C Time in counts according to the RTIG file.	DSC	DSC

Functional Group: Data Processing**Functional Element: Level 0 Reporting**

Req Class	Req #	Parent	Description		
AD	22100	Derived	Level 0 Status files will be forwarded to the GS SAFS for distribution upon completion of processing.	DSC	DSC
AD	22110	MOIS(N), Section 6.2	Immediately upon completion of Level 0 processing NGN will produce an LORL summary file with Level 0 processing results, according to the format given in the MOIF Format Description Document.	DSC	DSC
AD	22120	Derived	The LORL file shall be made available for retrieval by NASDA via the MOIF Interface (Ref AD11010).	WOTIS	FAIF
AD	22130	NASA	The TSI Data Stripper Quality & Accounting file shall be generated and reported to the Master/Host Controller for possible retrieval.	DSC	DSC
AD	22140	NASA	The DSC will report anomalies detected during Level 0 data processing to the GS, via the Master/Host Controller.	DSC	DSC
AD	22150	NASA	Any Level 0 anomalies will be acted upon as soon as possible by the GS Operations staff, or other designated personnel.	GS	GS

Functional Group: Data Distribution**Functional Element: Magnetic Media Distribution**

Req Class	Req #	Parent	Description		
AD	31100	MOIS(N), Section 6.3	NGN shall ship primary raw data tape recordings to NASDA nominally three times per week. Shipment schedule may be amended by mutual agreement between NASDA and NGN.	GS	GS
AD	31110	MOIS(N), Section 6.3	NGN shall produce a raw tape shipping record file, called an SRRM, immediately upon tape transfer to the carrier, as specified in the MOIF Format Description Document.	WOTIS	FAIF
AD	31120	Derived	The SRRM file shall be made available for retrieval by NASDA upon production via the MOIF Interface (Ref AD11010).	WOTIS	FAIF
AD	31130	MOIS(N), Section 6.3	NGN shall process the tape readability report, RDRM, received from NASDA, and inform the GS to ship the correct backup tape in case the primary is reported to be bad, or to release the backup tape for reuse.	WOTIS	FAIF
AD	31140	Derived	NGN shall ship the backup tape to NASDA if so indicated by NASDA.	GS	GS
AD	31150	MOIS(N), Section 6.3	If the RDRM indicates that a backup tape is to be shipped to NASDA, an SRRM file shall be generated and made available for retrieval by NASDA, upon shipment of the backup tape, via the MOIF Interface (Ref AD11010).	WOTIS	FAIF
AD	31160	MOIF, RERC/B File	NGN will conform to the tape labeling requirements as defined by NASDA.	WOTIS	FAIF

Functional Group: Data Distribution**Functional Element: Level 0 Data Distribution**

Req Class	Req #	Parent	Description		
AD	32100	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 2, NGN shall distribute VMS and DMS(1&2) MRT & MDR data to EOC within 100 minutes of GS acquisition in case of a S/C anomaly.	SAFS	SAFS
AD	32110	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 1, NGN shall distribute VMS and DMS(1&2) MRT data to EOC within 100 minutes of GS acquisition in case of a S/C anomaly.	SAFS	SAFS
AD	32120	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 1 or 2, NGN shall distribute at least 70% of the DCS MDR data to NOAA within 100 minutes of observation.	SAFS	SAFS
AD	32130	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 1 or 2, NGN shall distribute at least 70% of the DCS MRT data to NOAA within 100 minutes of LOS at GS.	SAFS	SAFS
AD	32140	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 2, NGN shall distribute ILAS II MDR data to EOC within 100 minutes of observation.	SAFS	SAFS
AD	32150	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 2, NGN shall distribute HK Source packet data to EOC and JPL within 100 minutes of observation.	SAFS	SAFS
AD	32160	MOIS(N), Section 5.2	After receiving and processing downlink data in Mode 2, NGN shall distribute SeaWinds data to NOAA within 100 minutes of observation.	SAFS	SAFS
AD	32170	MOIS(N), Section 5.4	After receiving and processing downlink data in Mode 2, NGN shall deliver SeaWinds Level 0 data and HK source packet data to SeaPAC using the EMSNet Network Interface and SAFS.	SAFS	SAFS
AD	32180	MOIS(N), Section 5.4	After receiving and processing downlink data in Mode 2, NGN shall deliver MDR SeaWinds, GLI-1km (selected portions), and DCS as well as MRT DCS and GLI-1km (selected portions) Level 0 data to NOAA using SAFS. WFF shall distribute GLI to NOAA within 4 hours from LOS.	SAFS	SAFS
AD	32190	MOIS(N), Section 5.4	After receiving and processing downlink data in Mode 2, NGN shall deliver AMSR, ILAS-II, TEDA, DCS, VMS, and DMS(1&2) Level 0 data to NASDA via the EMSNet Network Interface and SAFS.	SAFS	SAFS
AD	32200	MOIS(N), Section 4.2	SAFS will support the NASDA DRN (SMTP Mail), File Pull, RCN (SMTP Mail) procedure for the distribution of data files and status files.	SAFS	SAFS

Functional Group: Data Storage**Functional Element: Tape Storage**

Req Class	Req #	Parent	Description		
AD	41100	AGSIRD, Section 3.4.3	NGN will store the backup copy of all tapes recorded at the GS for TBD long .	GS	GS
AD	41110	MOIS(N), Section 5.7	The backup copy of tapes stored at the GS may be erased for reuse (if not forwarded to NASDA per AD31140) upon receipt of a good RDRM or 30 days, which ever occurs sooner.	GS	GS
AD	41120	<<NEED REFERENCE>> T B D	NASDA will furnish blank D1 cassette tapes for recording primary raw mission data in SONY recorders	GS	GS

AD	41130	<<NEED REFERENCE>> T B D	NASA will furnish blank D1 cassette tapes for recording backup raw mission data in SONY recorders	GS	GS
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Functional Group: Data Storage

Functional Element: Level 0 Data & Status File Storage

Req Class	Req #	Parent	Description		
AD	42100	MOIS(N), Section 5.7	NGN will archive a copy of all completed Level 0 data and status files on the SAFS (Central or Station) for a period of 96 hours after data acquisition.	SAFS	SAFS
AD	42110	Derived	After a storage period of 96 hours on the SAFS, data and status files will be automatically purged.	SAFS	SAFS

Functional Group: Testing

Functional Element: NASDA System Testing

Req Class	Req #	Parent	Description		
AD	51100	MSTP, Part I	NGN will support NASDA Off-Line Testing, as described in the ADEOS-II Mission Simulation Test Plan.	GS	GS
AD	51110	MSTP, Part II	NGN will support NASDA On-Line Testing, as described in the ADEOS-II Mission Simulation Test Plan.	GS	GS
AD	51120	MSTP, Part III	NGN will support NASDA Operational Testing, as described in the ADEOS-II Mission Simulation Test Plan.	GS	GS
AD	51130	MSTP, Part IV	NGN will support NASDA End-to-End Testing, as described in the ADEOS-II Mission Simulation Test Plan.	GS	GS

Functional Group: Testing

Functional Element: System Proficiency Testing

Req Class	Req #	Parent	Description		
AD	52100	NASA	NGN will support NASA/NASDA System Proficiency Testing	GS	GS

5.0 Test Information Sheets

The ADEOS-II NGN Ground System tests are defined using Test Information Sheets. These tests will functionally exercise the ground system in the normal, and Launch and Early Orbit mission modes, using hardware and software designated for mission support. The successful completion of the following eleven tests will verify the ADEOS-II NGN Ground System's capability to satisfy functional and performance requirements as an integrated system in an operational environment. Some of the tests will be performed as an integral part of the NASDA Mission Simulation Test sequence, as described in the Mission Simulation Test Plan; these tests are shown below next to the companion NGN Ground System test.

<u>Test No.</u>	<u>NGN Ground System Test Title</u>	<u>NASDA Mission Simulation Test</u>
1	Network Connectivity Test	Part II, Test (1)
2	Large File Transfer Test	
3	Planning & Scheduling, Off-Line	Part I, Test (4)
4	Planning & Scheduling, On-Line	Part II, Test (4)
5	Data Processing	
6	Telemetry Processing, Single Band Reception	
7	Telemetry Processing, X-Band RF Verification	
8	Telemetry Processing, Data Recording, PN Code	Part I, Test (1)
9	Telemetry Processing, Data Recording, PFM Data	
10	Data Distribution, n-Day Test	Part III, CoO
11	Data Readability	Part II, Test (2)
12	Integrated Ground Station Test	Part III
13	Anomaly Testing	Part III
14	Proficiency Testing	TBD
15	On-Orbit Testing	TBD

Test diagrams will indicate the applicable subset of the NGN diagram shown in Figure 5.0-1. Section 6 contains a matrix that cross-references each test to the requirements.

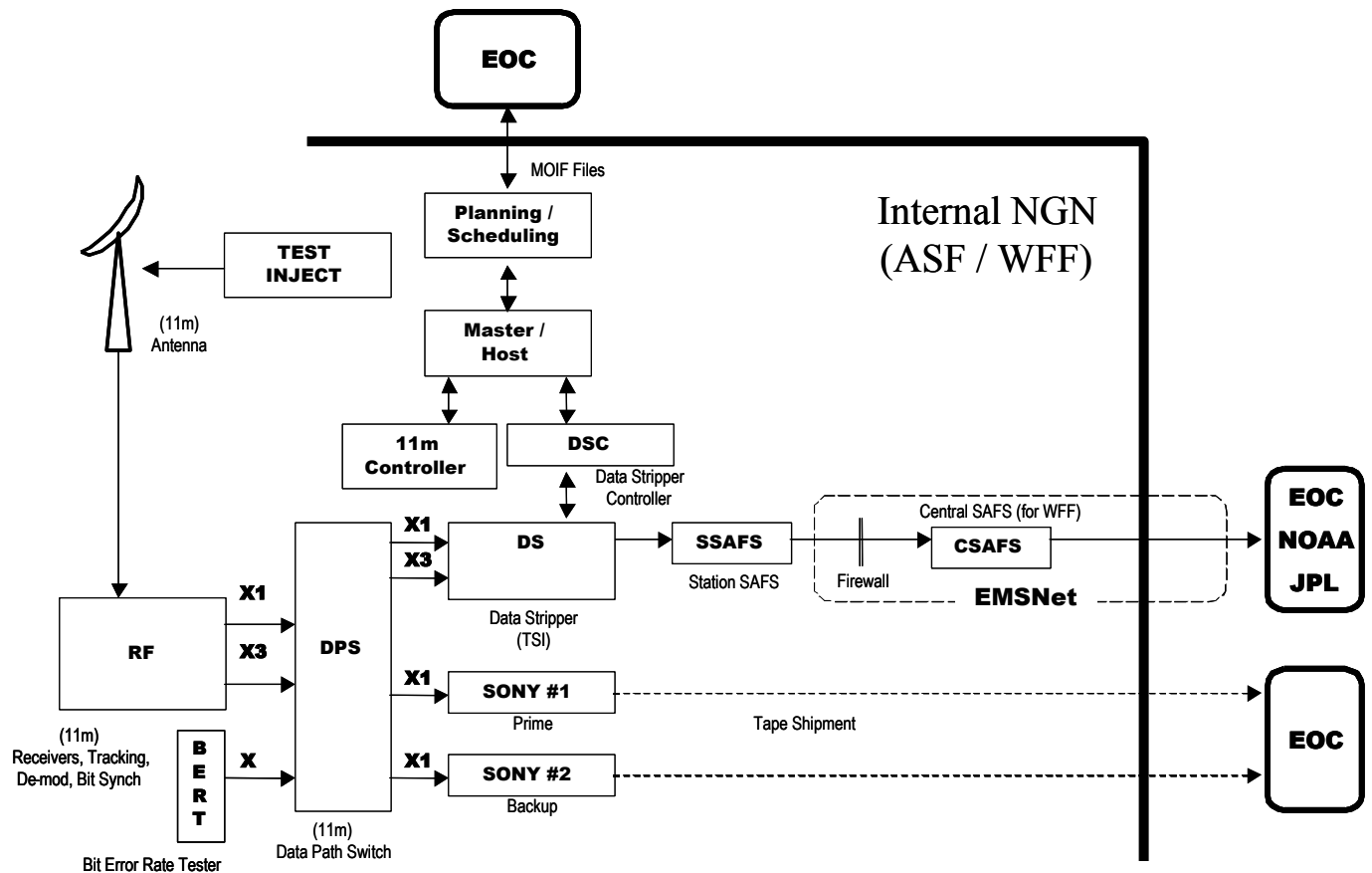


Figure 5.0 – NGN High Level Diagram

5.1 Network Connectivity Test

Test Purpose

The purpose of the test is to verify that proper connectivity exists between the NGN scheduling/reporting systems (ASF & WFF) and the MOIF processing system at EOC in Japan.

Type of Test

☒ Engineering
☒ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☒ Other: Confirm MOIF handshake protocol

Facilities Involved

☒ ASF
☒ EOC
☐ NOAA
☐ SeaPac
☐ WFF
☐ CSAFS (GSFC)
☒ White Sands
☒ Other: NISN

Ground System Elements

☒ Networks
☒ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

NASDA participation in this test will be the same as MST, Part II, Network Connection Test. The test will use a combination of PING and TRACEROUTE, as allowed and applicable (or other services provided by NISN), to establish and verify proper connectivity. The test will be successfully completed with the TELNET connection between NGN and EOC (for the express purpose of changing the FTP login password), and the transfer of test MOIF between NGN and EOC using the ADEOS II DRN/RCN protocol.

Prerequisite

- a. NGN scheduling/reporting system availability (designated NGN in this test description).
- b. EOC DDS availability
- c. NISN availability
- c. Two test MOIF: one to verify the DDS to NGN interface, and one to verify the NGN to DDS interface. The content of the files is not important; they will only be used to verify the DRN/RCN protocol used in the ADEOS mission.

Test Stimulus

Stimulus	Source
a. PING, TRACEROUTE, or other network tools	NGN, NISN, or EOC
b. TELNET login to change password	NGN/EOC
c. MOIF for transfer from DDS to NGN	EOC
d. MOIF for transfer from NGN to DDS	NGN

Test Scenario/Description

- a. Connectivity will be established and verified using any combination of network tools applicable (within the constraints of existing network security). These may be PING, TRACEROUTE, or other tools as determined by NGN, NISN and EOC.
- b. After connectivity is established, NGN will initiate a TELNET session to the DDS for the purpose of changing the login password.
- c. EOC will subsequently initiate a TELNET session to the NGN for the purpose of changing the login password.
- d. Upon completion of the TELNET sessions, MMO will send an email to NGN, using the mission address(es) specified in the Network Communications ICD.
- e. NGN will confirm the return capability by sending an email to MMO, using the mission address specified in the Network Communications ICD.
- f. Upon completion of the above two steps, MMO will initiate a DRN to NGN for the retrieval of a test MOIF (e.g. ED20 definitive ephemeris file).
- g. NGN will make an FTP connection to DDS, successfully retrieve the test MOIF, and return a RCN confirmation message.
- h. NGN will initiate a DRN to MMO for the retrieval of a test MOIF (e.g. RERC pass results file).

- i. MMO will make an FTP connection to NGN, successfully retrieve the test MOIF, and return a RCN confirmation message.
- j. Any discrepancies noted will be examined; any test elements needing remedial action will be corrected, and the corresponding test steps repeated.

Expected Results for a Successful Test

- a. Connectivity between EOC DDS and NGN must be established.
- b. The TELNET session from NGN to DDS must be established, and the WFF or ASF password on the DDS must be successfully changed.
- d. The TELNET session from DDS to NGN must be established, and the DDS password on the NGN workstation must be successfully changed.
- e. The exchange of test MOIF between MMO and NGN must be successful in both directions.
- f. Any discrepancies noted will have been resolved.

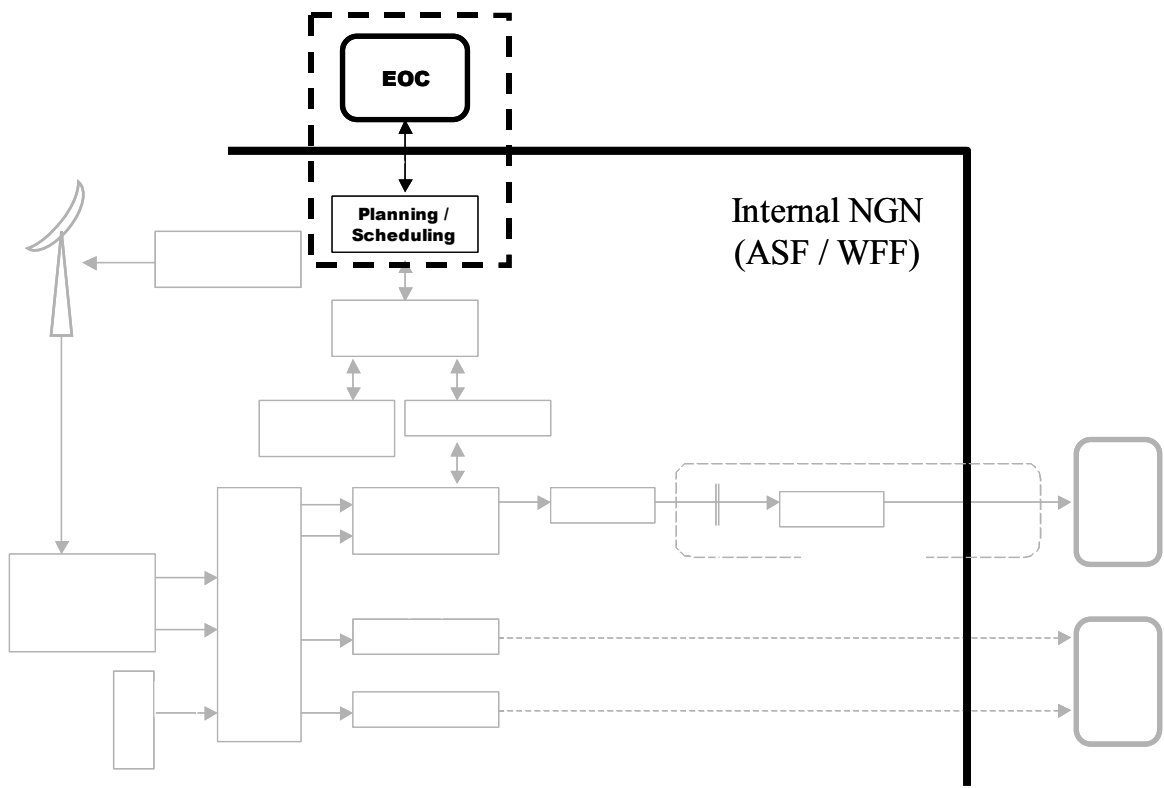


Figure 5.1 – Network Connectivity Test



5.2 Large File Transfer Test

Test Purpose

The purpose of the test is to demonstrate connectivity between ADEOS II NGN Ground Stations and customers receiving Level-0 data via ADEOS II networks. Data will be collected to demonstrate the performance and characteristics of the networks, and to verify that work station Operating System settings support the network bandwidth available.

Type of Test

☒ Engineering
☐ Operability
☒ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☒ Collect throughput data
☐ Collect reliability data
☒ Collect performance data
☐ Verify requirements are met
☐ Other:

Facilities Involved

☒ ASF
☒ EOC
☒ NOAA
☒ SeaPac
☒ WFF
☒ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☒ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

NASDA involvement in this test is limited to multiple FTP Pulls of a large file from locations within the NGN (as determined for each run of the test), and the reporting of metrics for the operation.

Comments

A script/CRON job can be provided to NASDA to automate this test.

Prerequisite

- a. Scheduling System for scheduling the test so as not to interfere with ongoing operations.
- b. A large dummy file to be used in the transfer.
- c. Workstations at WFF, ASF, JPL, NOAA, and EOC for file staging, and file transfers using FTP and FastCopy.

Test Stimulus**Stimulus****Source**

- | | |
|---|---------------------------------|
| <ul style="list-style-type: none"> a. Large dummy data file b. Test Condition forms with detailed test instructions | <p>WFF</p> <p>WFF & ASF</p> |
|---|---------------------------------|

Test Scenario/Description

- a. Within predetermined windows, as detailed in the script, JPL, NASDA, and NOAA will begin the file transfer process.
- b. The receiving station will “GET” the file using the standard FTP protocol, and/or FastCopy
- c. As possible, each sending and receiving station will record the start and/or completion times of the file transfer.
- d. Times for begin and end of the transfer can be recorded by JPL, NOAA, and NASDA. NASDA (EOC) and JPL by employing the Unix command “netstat -s” just before and just after the transfer.
- e. The results from running netstat will be forwarded to the test director. SAFS logging will not be available, since SAFS does not log FTP Pull operations (only time of initial FTP connection).

Expected Results for a Successful Test

Successful completion of this test will provide a much better understanding of the performance of various parts of the NGN systems. It will help the NGN make sure that the operating systems are properly setup to utilize the available bandwidth for ADEOS II level 0 data transfer during the operational part of the mission.

- a. From the network monitoring results the available bandwidth at the time of the test (for each transfer) can be determined.
- b. From the network monitoring results an estimate of bandwidth utilized can be made.
- c. From the time taken for the transfer, the transfer rate can be determined.
- d. From these three data points, some conclusion can be reached about the over all system performance and utilization. Possible corrective actions (if determined to be needed) can be suggested.

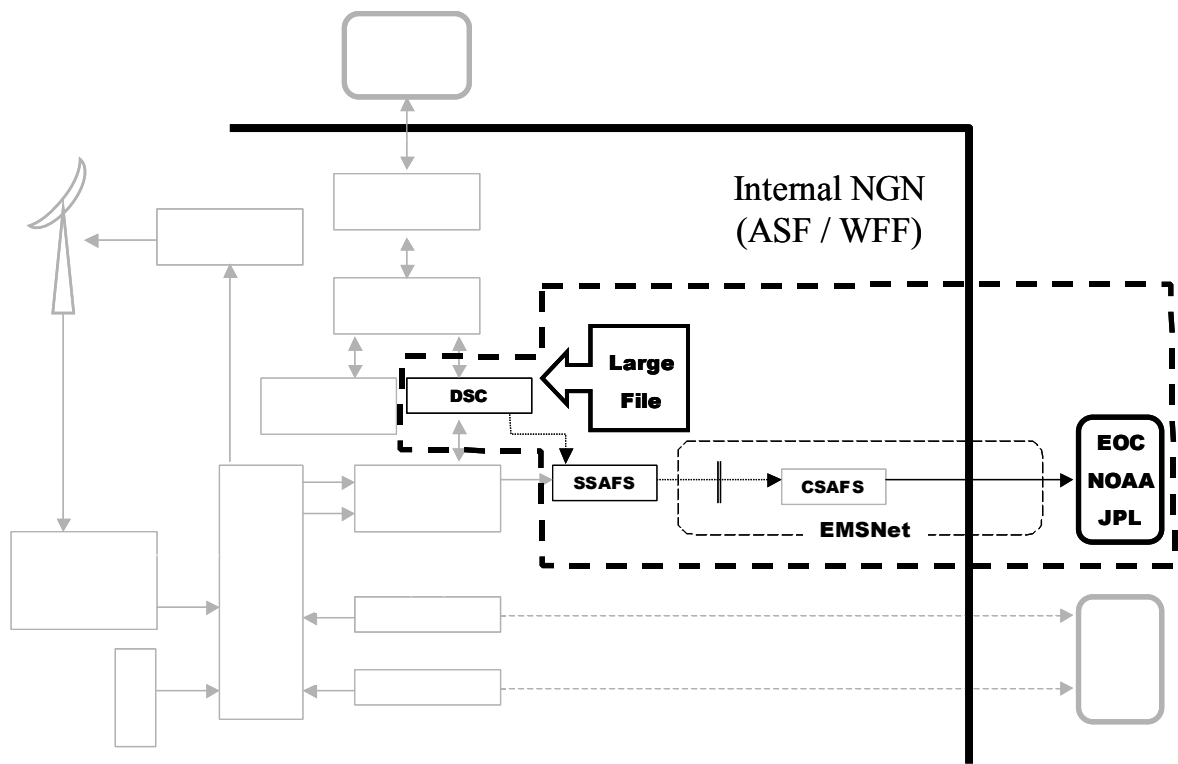


Figure 5.2 – Large File Transfer Test



5.3 Planning & Scheduling, Off-Line

Test Purpose

The purpose of the test is to demonstrate the readability of ADEOS II Mission Operation Interface Files (MOIF), the ability to generate MOIF, and the proper use of MOIF in ADEOS II scheduling.

Type of Test

☒ Engineering
☒ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☒ Other: Confirm readability of MOIF

Facilities Involved

☐ ASF
☒ EOC
☐ NOAA
☐ SeaPac
☐ WFF
☐ CSAFS (GSFC)
☒ White Sands
☐ Other:

Ground System Elements

☐ Networks
☒ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other: MOIF generation & processing

NASDA Participation

NASDA participation in this test will be the same as MST, Part I, Off-Line File Transfer. As determined by NGN and NASDA, this test may not have to be conducted. The Planning & Scheduling, On-Line test may remove the need for this test.

Prerequisite

- a. Scheduling System availability so as not to interfere with ongoing operations.
- b. DSC used to ingest an LV0P file and create a dummy L0RL file.

Test Stimulus

Stimulus	Source
a. REQR, SHAQ, ELMP, LV0P, RDRM files	EOC
b. STGS, RERC, RERB, L0RL, SRRM files	NGN SCHEDULING
c. Test Condition forms with detailed test instructions	EOC

Test Scenario/Description

- a. REQR, SHAQ, ELMP, and RDRM test files will be created by EOC and sent to WFF and ASF on 8mm tape cassettes and e-mail.
- b. NGN will read the e-mail and/or 8mm tapes and verify, by visual inspection, that the correct files have been received in the correct format.
- c. NGN will ingest the MOIF information into their respective scheduling systems, and will produce corresponding STGS, RERC, RERB, SRRM files.
- d. WFF will read and ingest an LV0P file from the EOC e-mail and/or 8mm tape into the DSC, and create a dummy L0RL file.
- e. All files created by WFF will be forwarded to EOC via e-mail.
- f. All files created by ASF will be written to e-mail or to a new 8mm tape and (e-mailed) shipped to EOC.
- g. NASDA supplied Test Procedure forms will be filled out by NGN and NASDA, respectively, and exchanged.
- h. NGN will receive, review, and file Test Procedure forms from NASDA.
- i. Any discrepancies noted in the Test Procedure forms will be examined, and any test elements needing remedial action will be corrected, and the corresponding test steps repeated.

Expected Results for a Successful Test

- a. All files must be ingested properly into the scheduling systems, DSC, and EOC.
- b. All files created by the scheduling systems, DSC, and EOC must be in the proper format, according to the Format Description of Mission Operation Information Files (NGN).
- c. Any discrepancies noted will have been resolved.

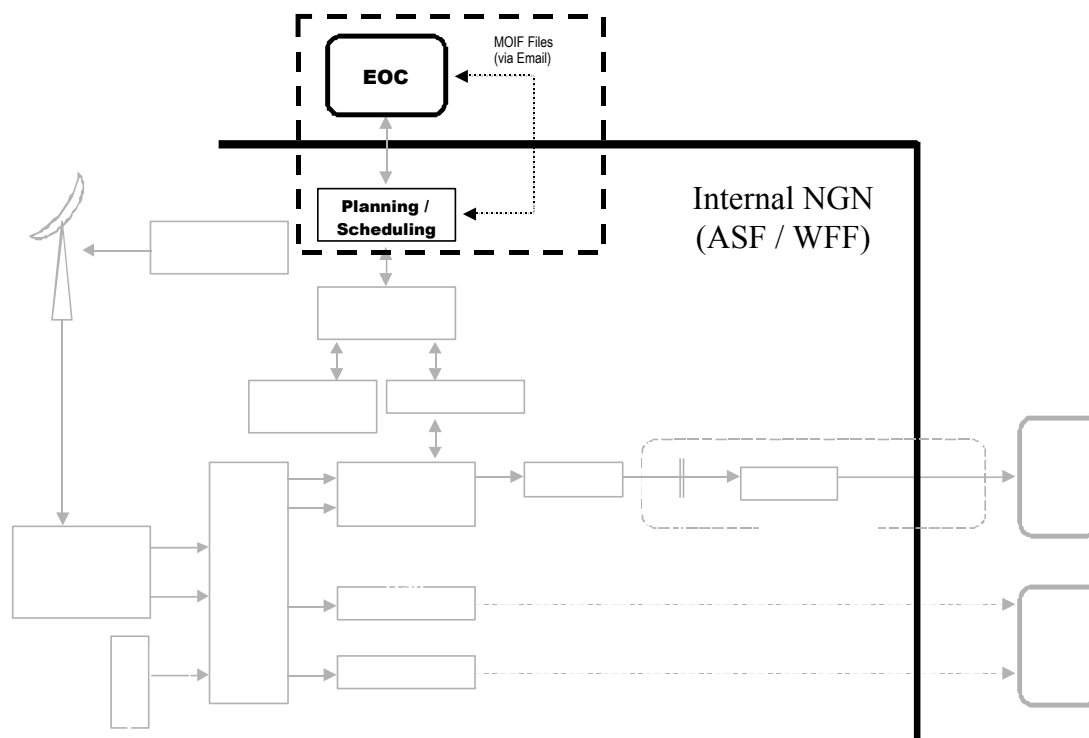


Figure 5.3 – Planning & Scheduling, Off-Line Test



5.4 Planning & Scheduling, On-Line

Test Purpose

The purpose of the test is to demonstrate the ability of NGN to support all Mission Operation Interface File (MOIF) requirements, including scheduling, file generation, and delivery of files via the ADEOS II networks.

Type of Test

☐ Engineering
☒ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☒ Other: Confirm proper operation of complete MOIF system

Facilities Involved

☒ ASF
☒ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☒ White Sands
☐ Other:

Ground System Elements

☒ Networks
☒ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☒ Other: MOIF system

NASDA Participation

NASDA participation in this test will be the same as MST, Part I, On-Line File Transfer. If it this test is successfully run, the Off-Line test of the Planning & Scheduling system may not be needed.

Prerequisite

- a. Network connectivity between NGN, and EOC
- b. Scheduling availability.
- c. Simulated L0RL file.

Test Stimulus

Stimulus	Source
a. DRN's for each of the files to be exchanged (REQR, SHAQ, ELMP, LV0P, RDRM)	EOC
b. DRN's for each of the files to be exchanged (STGS, RERC, RERB, L0RL, SRRM)	NGN SCHEDULING
c. Test Condition forms with detailed test instructions	EOC

Test Scenario/Description

- a. REQR, SHAQ, ELMP, LV0P, and RDRM test files will be created by EOC, a DRN created for each file, and the DRN emailed to NGN.
- b. NGN will act on the DRN, retrieve (via FTP) the proper file according to the DRN, and return a RCN via email to EOC.
- c. NGN will ingest the MOIF information into their respective scheduling systems, and will produce corresponding STGS, RERC, RERB, SRRM files.
- d. NGN will read and ingest the LV0P file from EOC and create a dummy L0RL file.
- e. For each file created by NGN, an associated DRN will be created and mailed to EOC.
- f. EOC will act on the DRN, retrieve (via FTP) the proper file according to the DRN, and return a RCN via email to NGN.
- g. The proper ADEOS-II mission file ordering (but not timing) should be observed for the file exchange: REQR (EOC), STGS (NGN), SHAQ (EOC), ELMP (EOC), LV0P (EOC), RERC & RERB (NGN), SRRM (NGN), RDRM (EOC).
- h. NASDA supplied Test Procedure forms will be filled out by NGN and NASDA, respectively, and exchanged.
- i. NGN will receive, review, and file Test Procedure forms from NASDA.
- j. Any discrepancies noted in the Test Procedure forms will be examined, and any test elements needing remedial action will be corrected, and the corresponding test steps repeated.

Expected Results for a Successful Test

- a. The DRN/RCN procedure must work properly (automatically with proper retry and operator notification in case of unrecoverable errors).
- b. All files must be ingested properly into the scheduling systems, DSC, and EOC.
- c. All files created by scheduling systems, DSC, and EOC must be in the proper format, according to the Format Description of Mission Operation Information Files (MOIF).
- d. Any discrepancies noted will have been resolved.

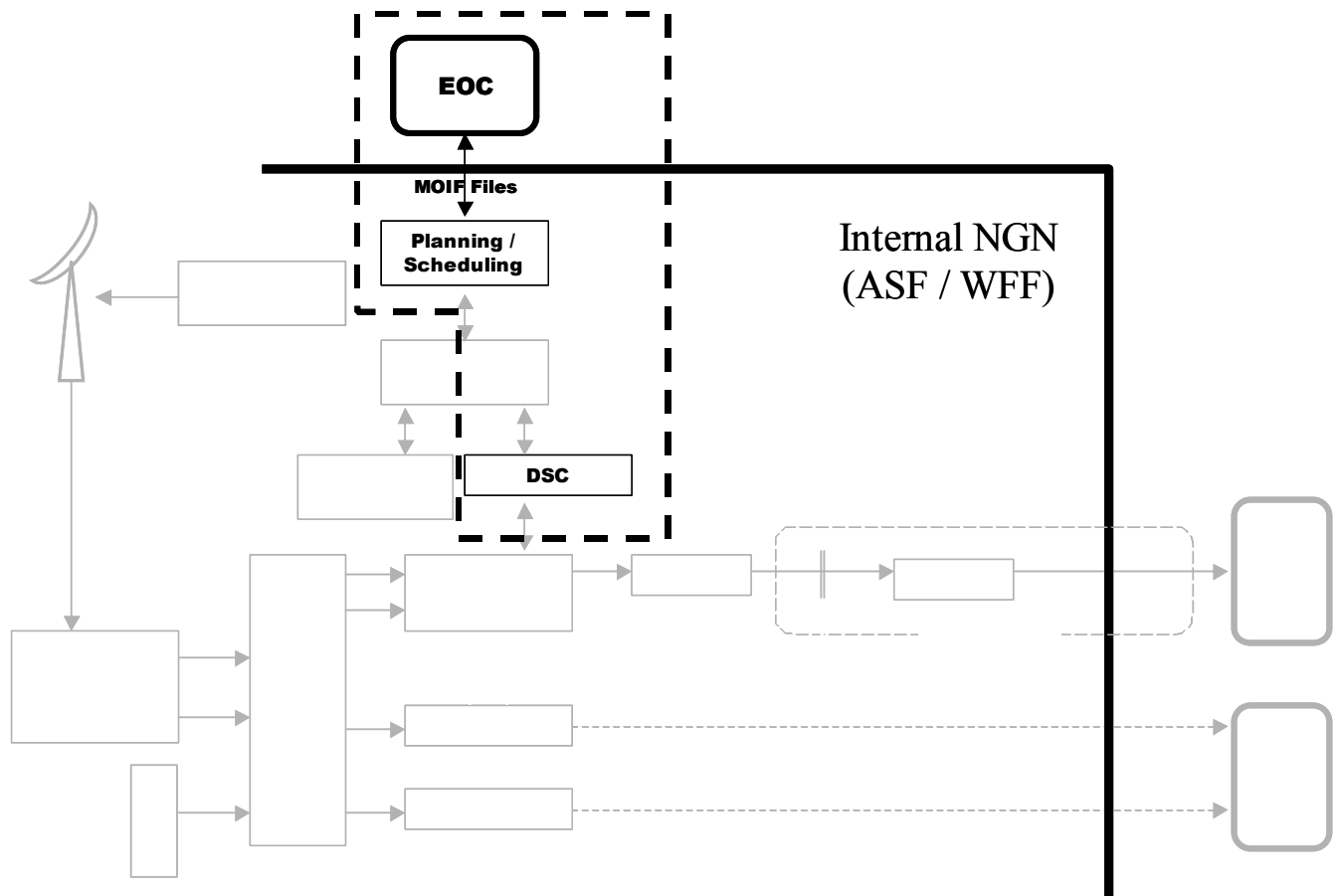


Figure 5.4 – Planning & Scheduling, On-Line Test



5.5 Data Processing

Test Purpose

The purpose of the test is to verify proper operation of the TSI Data Stripper (DS) and Data Stripper Controller (DSC), collectively called the DSNode. The test will insure the DSNode is capable of generating the proper Level-0 (L0) data files and associated status files, including the subset GLI-1K file as instructed by the RTIG MOIF file. The test will verify the proper L0 files, as determined by the LV0P, are forwarded to the SAFS, and that all proper summary files are created by the DSC.

Type of Test

☒ Engineering
☒ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☐ Other:

Facilities Involved

☒ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☒ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

There is no NASDA involvement in this test.

Prerequisite

- a. 11m antenna availability (properly scheduled for testing)
- b. 2 Sony ID1 recorders (if used).
- c. ATS Controller.
- d. DSC & DS.
- e. SAFS (test directory for holding finished files)

Test Stimulus**Stimulus**

- a. Test is run manually; GS must be properly scheduled

Source

NGN

Test Scenario/Description

- a. Although a complete Data Processing test will be run using 2 Sony ID1 tape recorders as a source of X1 (60 MPS) and X3 (6 MPS) PFM data, simpler versions can be run using a single data stream from a single tape recorder, or by making use of the Data Stripper's simulated data generator.
- b. For the complete test, data from the two Sony ID1 recorders will be passed through the 11m Data Path switch into the DS unit, under the control of the ATS Controller. Note that a dummy Ephemeris file may be necessary for the event to be scheduled on the 11m antenna (which controls the Data Path switch).
- c. The DSC will initiate the stripping operation, and should monitor the DS process as the stripping progresses.
- d. The DSC should properly update the ATS Controller with status information.
- e. A manually created LV0P file will be used to control which of the stripped files are to be moved on to the SAFS for distribution. All L0 files (and associated status files) should be sent to a test directory on the SAFS (no further distribution is to occur).
- f. Upon completion of the stripping operation, the DSC should create a status file for the ATS Controller, from which the WFF Pass Results File will be generated.
- g. Upon completion of all operations, the DSC should create the L0RL file, and forward it to the ATS Controller.
- h. Upon completion of all operations, the DSC should forward the TSI Q&A file to the ATS Controller.
- i. When the test is complete, all logs should be examined.
- j. The test will be repeated for each different type of LV0P file.

Expected Results for a Successful Test

- a. The DS/DSC operation should begin and end normally.
- b. The proper L0 and status files should be created, and forwarded to the SAFS according to the LV0Ps.
- c. Realtime monitoring of the DS/DSC operation should be available on the ATS Controller.
- d. The GL1-1K subset data should be created according to the RTIG file.
- e. All summary files, including the L0RL, WFF high level status file, and TSI Q&A file should be properly created.
- f. Any discrepancies noted will have been resolved.

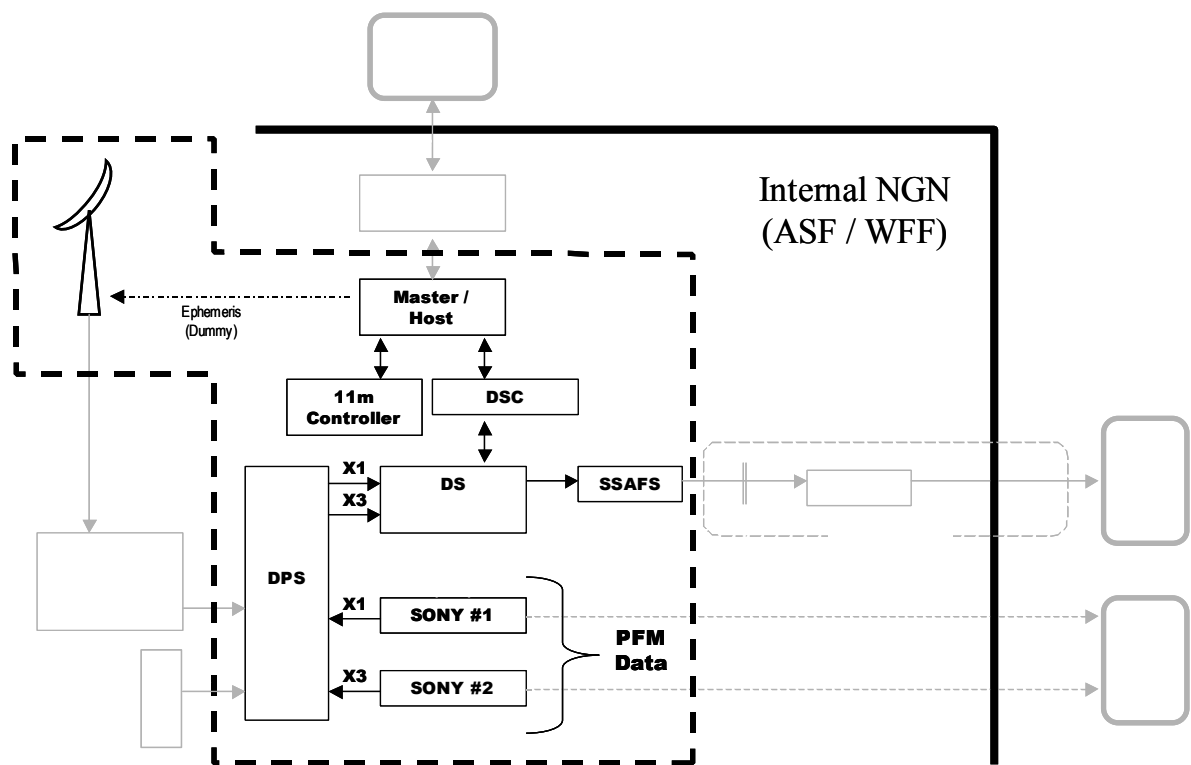


Figure 5.5 – Data Processing Test



5.6 Telemetry Processing, Single Band Reception

Test Purpose

To verify each NGN GS is capable of receiving a single band (X1 or X3) of ADEOS-II data, via test inject into the 11m antenna, performing bit synchronization, and passing the data into the DS node for frame synchronization and stripping of the data according to APID.

Type of Test

☒ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☐ Other:

Facilities Involved

☐ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☒ Recording
☒ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

There is no NASDA involvement in this test.

Prerequisite

- a. 11m antenna availability (properly scheduled for testing)
- b. Sony ID1 recorder.
- c. Proper setup for test inject of PFM data into the 11m
- d. ATS Controller.
- e. DSC & DS.

Test Stimulus**Stimulus**

- a. Test is run manually; GS must be properly scheduled.

Source

NGN

Test Scenario/Description

- a. For the complete test, data from one Sony ID1 recorder will be injected into the 11m antenna, processed through the RF section (including bit syncs), and passed through the 11m Data Path switch into the DS unit. The DS will only need to produce one file for each APID. Note that a dummy Ephemeris file may be necessary for the event to be scheduled on the 11m antenna.
- b. Set up the NGN receiving station for test inject usage, including mounting the tape.
Schedule the antenna code for the downlink to be tested (X1 or X3), using dummy ephemeris. During the test, monitor the station status, such as antenna movement, receiver lock and input levels, demodulator and bit synchronization lock.
- c. Set up the DSC/DS using a test schedule and the ATS Controller.
- d. Play the data to the DS, via the test inject capability of the 11 meter antenna.
- e. Monitor the DS during the run, verifying that there are no errors.
- f. Verify the correct operation of the DS/DSC/ATS Controller.
- g. Verify that the correct set of DS output files are generated, and sent to the SAFS.
- h. Verify that the correct reports are generated, including the Post Pass Summary (WFF) and Tracking file.
- i. When the test is complete, all logs should be examined.

Expected Results for a Successful Test

- a. The data played back from the tape and injected into the antenna should be received without errors, and should allow the DS to produce the correct number of data files (according to the number of valid APIDs), also without errors.
- b. Operation of the DS/DSC should be nominal.
- c. Operation of the ATS Controller should be nominal.
- d. Any discrepancies noted will have been resolved.

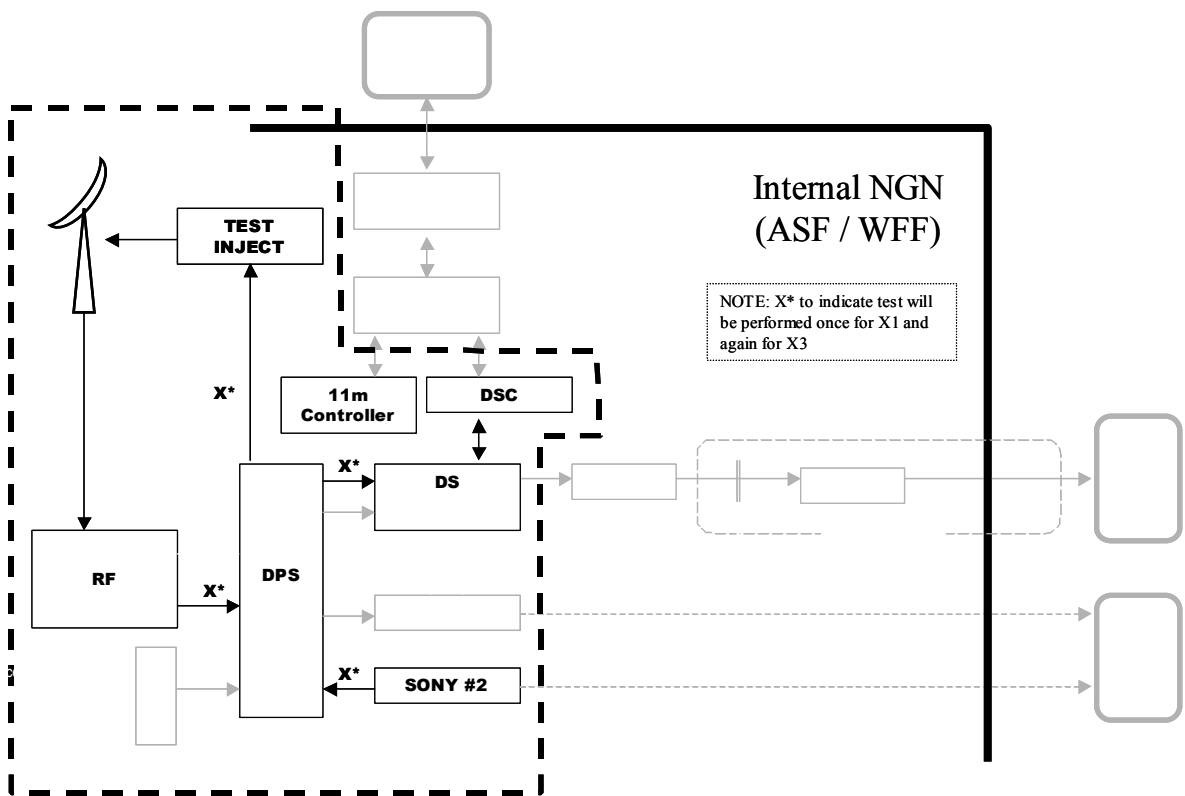


Figure 5.6 – Telemetry Processing, Single Band Reception



5.7 Telemetry Processing, X Band RF Verification

Test Purpose

To verify each NGN GS is capable of receiving both bands (X1 or X3) of ADEOS-II data, individually, via test inject into the 11m antenna, performing bit synchronization. The calibration tests verify the RF link levels. The performance tests measure the receiver thresholds, and the Bit Error Rate (BER) rate performance

Type of Test

☒ Engineering
☐ Operability
☒ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☒ Collect performance data
☒ Verify requirements are met
☐ Other:

Facilities Involved

☐ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☒ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

There is no NASDA involvement in this test.

Prerequisite

- a. 11m antenna availability (properly scheduled for testing)
- b. 2 Sony ID1 recorders.
- c. Proper setup for dual band test inject of PFM data into the 11m
- d. ATS Controller
- e. DSC & DS.

Test Stimulus**Stimulus**

- a. Test is run manually; GS must be properly scheduled.

Source

NGN

Test Scenario/Description

Refer to Appendix B: ADEOS-II / NGN RF X-Band Verification Procedure.

The following tests will be performed:

- a. X-Band RF Telemetry Calibration Tests
 - 1. CTX-1. X-Band Line Loss Measurement
 - 2. CTX-2. X-Band G/T Measurement
 - 3. CTX-3. X-Band C/N0 Measurement
 - 4. CTX-4. X-Band CW Receiver Threshold.
- b. X-Band Telemetry Performance Tests
 - 1. PTX-1. ADEOS-II X-Band BSSC Telemetry Threshold
 - 2. PTX-2. Bit Error Rate (BER) with PN data.

Expected Results for a Successful Test

- a. The data played back from the tape and injected into the antenna should be received without errors.
- b. Operation of the ATS Controller should be nominal.
- c. Threshold levels and BER performance should be nominal.
- d. Any discrepancies noted will have been resolved.

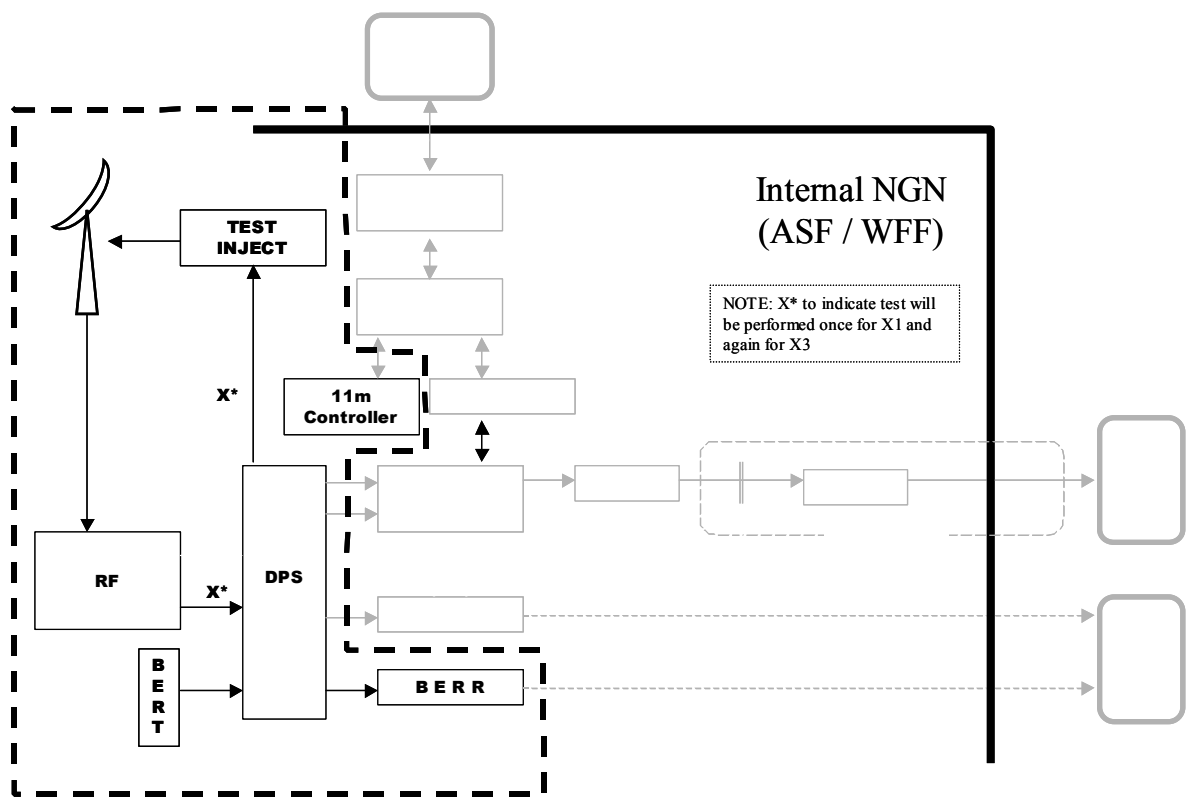


Figure 5.7 – Telemetry Processing, X-Band RF Verification



5.8 Telemetry Processing, Data Recording: PN Code

Test Purpose

The purpose of the test is to verify each NGN GS is capable of recording PN Code data on a Sony HDDR tape in a Sony ID1 recorder, and that EOC is capable of reading the same tape, when shipped to them.

Type of Test

☒ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☐ Other: Tape readability

Facilities Involved

☒ ASF
☒ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☒ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

NASDA involvement in this test consists of receiving the tape shipped from each ground station, and confirming readability of the PN data on the tape.

Comments

Tapes will be labeled per instructions in the NASDA MSTP, for MST, Part 1, Raw Data Pattern Test.

Prerequisite

- a. 11m antenna availability (properly scheduled for testing)
- b. Sony ID1 recorder.

Test Stimulus**Stimulus**

- a. Test is run manually; GS must be properly scheduled.

Source

NGN

Test Scenario/Description

- a. A bit error rate test setup will be used to generate fixed pattern data which will be recorded on a HDDR Sony cassette tape in one of the ID1 recorders.
- b. The tape will be shipped to NASDA (EOC) where it will be read on a Sony recorder, and verified.

Expected Results for a Successful Test

- a. The tape should be read by EOC without errors.
- b. Any discrepancies noted will have been resolved.

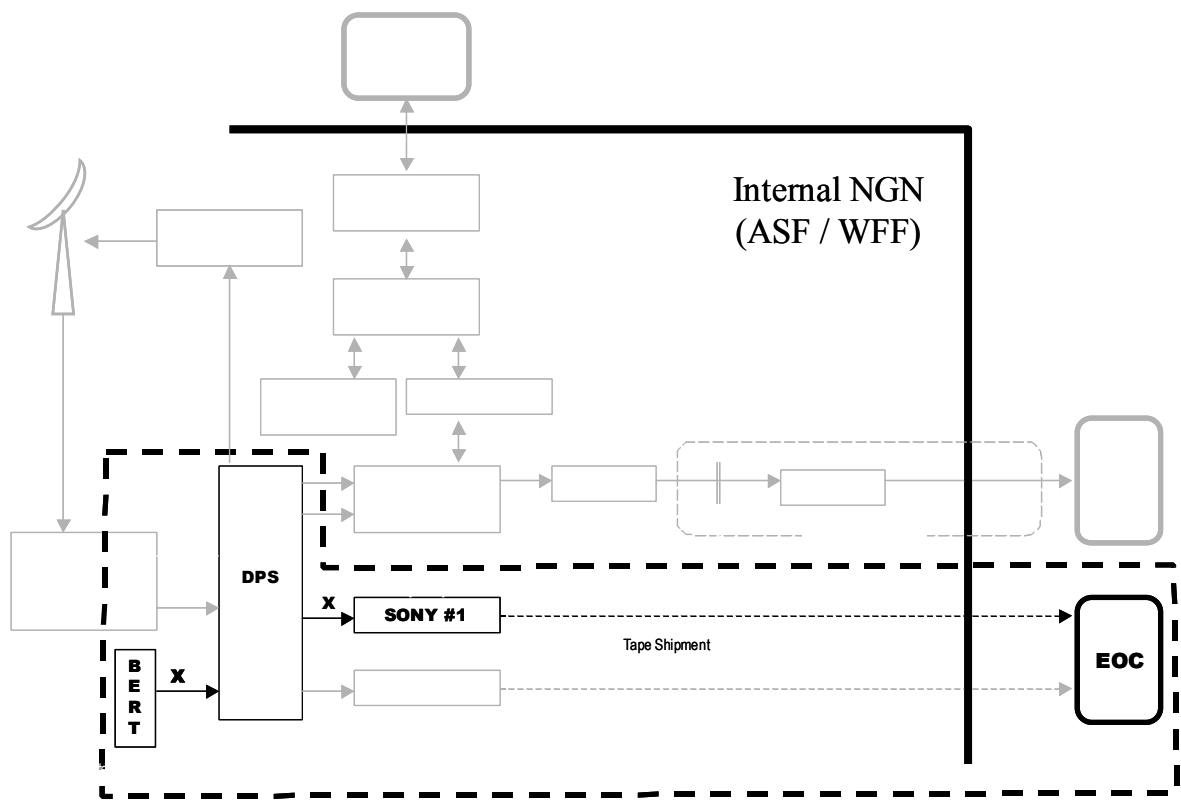


Figure 5.8 – Telemetry Processing, Data Recording: PN Code



5.9 Telemetry Processing, Data Recording: PFM

Test Purpose

The purpose of the test is to verify each NGN GS is capable of receiving either band (X1 and X3) of ADEOS-II data, via test inject into the 11m antenna, performing bit synchronization, and recording the data on a Sony ID1 recorder. Upon completion of recording, the tape will be rewound and played back into DS node for frame synchronization and stripping of the data stream according to APID. This test is ensure the recorded data can be properly processed by the DS node.

Type of Test

☒ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☐ Other:

Facilities Involved

☒ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☒ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☒ L0 file generation
☒ Recording
☒ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

There is no NASDA involvement in this test.

Prerequisite

- a. 11m antenna availability (properly scheduled for testing).
- b. Sony ID1 recorder.
- c. Proper setup for single band test inject of PFM data into the 11m
- d. ATS Controller.
- e. DSC & DS.

Test Stimulus**Stimulus**

- a. Test is run manually; GS must be properly scheduled.

Source

NGN

Test Scenario/Description

- a. Data from one Sony ID1 recorder will be injected into the 11m antenna, processed through the RF section (including bit syncs), and passed through the 11m Data Path switch for recording onto a second Sony ID1 recorder.
- b. If desired, the data can be simultaneously routed to the DS node for DS processing, and creation of a DS Q&A file.
- c. Upon completion of the record operation, the recorded tape is to be rewound and readied for a playback operation.
- d. At this point, the ATS Controller should produce the information necessary to create an RERC and RERB file; the RERC & RERB files should be properly generated and filed (no DRN is to be created).
- e. The second part of the test will consist of playing the recorded tape back into the DS node (same test as I&T 3).
- f. The DS will only need to produce one file for each APID.
- g. The Q&A file from the DS can, if desired, be checked against the statistics generated from step b.
- h. Note that, for each of the two portions of the test, a dummy Ephemeris file may be necessary for the event to be scheduled on the 11m antenna (which controls the Data Path switch).
- i. All processes should complete successfully.
- j. When the test is complete, all logs should be examined.

Expected Results for a Successful Test

- a. The data recorded and subsequently played back from the tape should allow the DS to produce the correct number of data files (according to the number of valid APIDs), without errors.
- b. All output should be verified as correct.
- c. Any discrepancies noted will have been resolved.

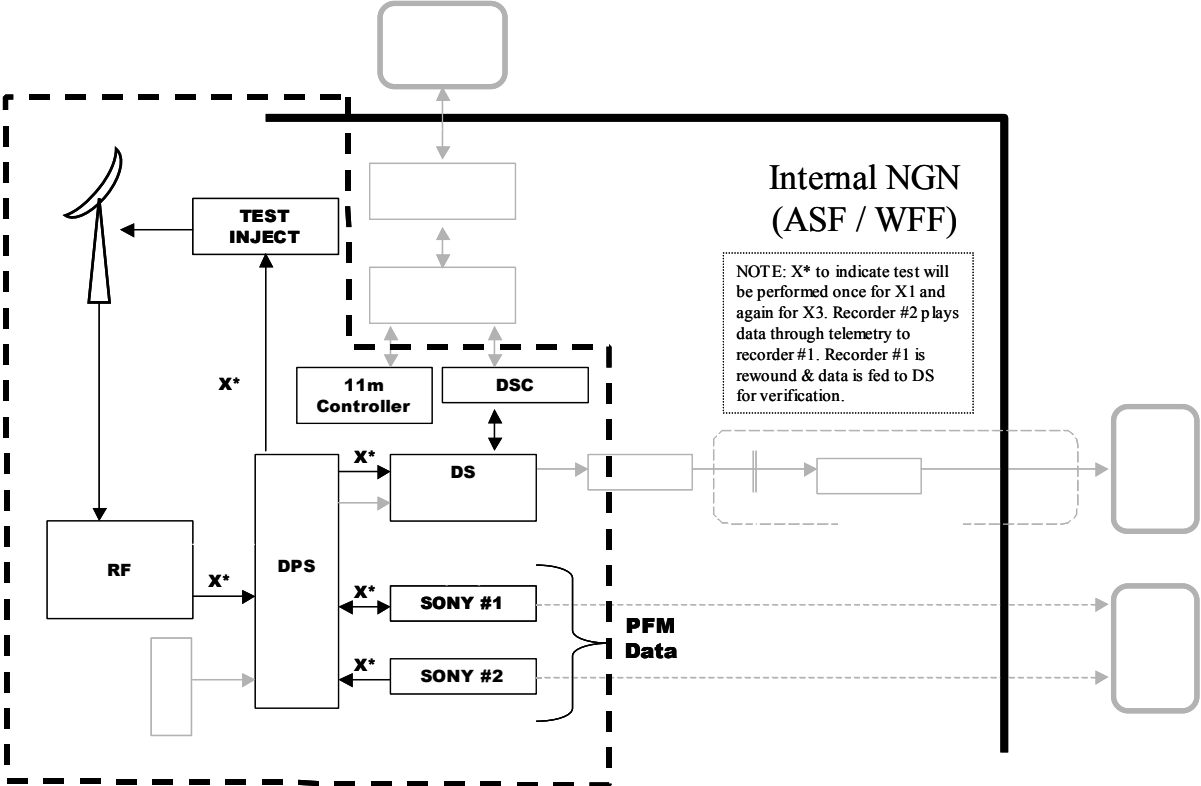


Figure 5.9 – Telemetry Processing, Data Recording: PFM



5.10 Data Distribution, n-Day Test

Test Purpose

The purpose of the test is to demonstrate connectivity between the ADEOS II NGN Ground Stations and customers. Data will be collected to measure the performance of the ADEOS II networks by the transfer of properly sized, dummy Level-0 files according to a realistic ADEOS II timeline. The test will also generate and forward the L0RL, RERC, and RERB summary files. This test mechanism is used to support the MST, Part 3, Continuous Operation (CoO) test detailed in the MSTP.

Type of Test

☐ Engineering
☐ Operability
☒ Performance
☒ Reliability
☐ Anomaly
☐ Other:

Test Objective

☒ Collect throughput data
☒ Collect reliability data
☒ Collect performance data
☐ Verify requirements are met
☐ Other:

Facilities Involved

☒ ASF
☒ EOC
☒ NOAA
☒ SeaPac
☒ WFF
☒ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☒ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

Dummy L-0 & Status files are generated according to ADEOS II mission timeline and delivered to all customers. Metrics are collected by NGN at delivery time. Files can be deleted by recipients any time after successful delivery.

Comments

The test will be more complete and representative of the real ADEOS Mission is if NASDA will generate and send files to the NGN

Prerequisite

- a. Operational network connections and bandwidths must be in place.
- b. All systems must be in working order, and the test properly scheduled at all sites.
- c. The NOAA user system must be able to receive the files that will be sent by FASTCOPY and manage their storage so it will not fill up.
- d. The JPL user system must be able to receive the files that will be sent by FASTCOPY and manage their storage so it will not fill up.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.

Test Stimulus

Stimulus

- a. DFG control spreadsheet with all file information.
- b. Test information sheet forwarded to all parties.

Source

NGN Test Director
NGN Test Director

Test Scenario/Description

- a. NGN will use a Data File Generator (DFG) which reads an Excel spreadsheet to determine date, time of day, and file size for each Level 0 file for the path that would be received at that time and date, using simulated data based on NASDA's 4-day repeat cycle. The DFG is capable of generating data for any span of time, by concatenating multiple repeat cycle data.
- b. The DFG will then generate a file of the proper size, filled with dummy data, and assign the proper name for the file.
- c. The DFG will generate a properly named status file to accompany the L0 data file.
- d. The DFG will forward all files, on the desired mission timeline, to the station SAFS for proper distribution according to the type of data.
- e. The SAFS at WFF and ASF will log the time that the file transfers (data and status files) are completed. The CSAFS at GSFC will log the time that the incoming files are detected unless the files are detected in a group. If files are detected together in a hot directory, they will be treated as a group, and the log time for each file will be that of the group. These systems will also record the time that a DRN is sent to EOC and the time when corresponding RCN is received back for each file type. The elapsed time will be determined from flag file receipt to RCN receipt.
- f. After completion of the tests, the SAFS logs will be transferred to the NGN for analysis. The time span from the file submission to station SAFS to completion of the file transfer, for each file type, will be calculated and compared to the allotted time in the data latency equation for the transfer. SAFS ADEOS-II logs will be purged after 96 hours.
- g. The results will be distributed to the NGN, NOAA, JPL, EOC by the NGN.

Expected Results for a Successful Test

- a. The DRN/RCN procedure must work properly.
- b. SAFS must properly log pertinent activity.
- c. Where file transfer times are out of tolerance, EOSDIS (NISN) help will be requested to isolate and correct problems.
- d. Any discrepancies noted will have been resolved.

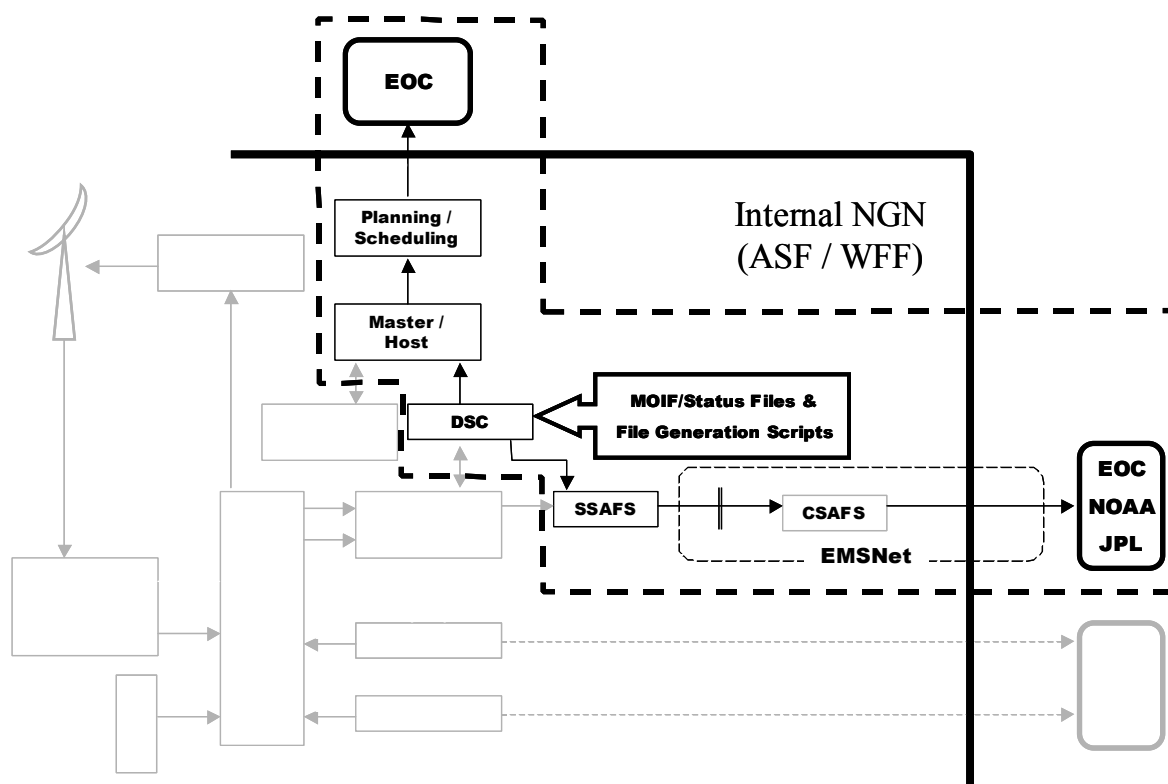


Figure 5.10 – Data Distribution, n-Day Test



5.11 Data Readability Test

Test Purpose

The purpose of the test is to demonstrate the ability of NGN to generate correct Level-0 data files and metafiles, and distribute them electronically to ADEOS II NGN customers.

Type of Test

☒ Engineering
☒ Operability
☐ Performance
☒ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☒ Verify requirements are met
☐ Other:

Facilities Involved

☒ ASF
☒ EOC
☒ NOAA
☒ SeaPac
☒ WFF
☒ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☒ Networks
☐ Scheduling
☒ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

NASDA involvement will be slight if the DRN/RCN process completes, but no other processing is done; files can be removed after successful delivery. If NASDA determines there is benefit from processing the L-0 data, then NASDA involvement could be more significant.

Comments

It is expected that NOAA & SeaPac would process the L-0 files, and confirm results back to WFF & ASF

Prerequisite

- a. Operational network connections and bandwidths must be in place.
- b. All systems must be in working order, and the test properly scheduled at all sites.
- c. The NOAA user system must be able to receive the files that will be sent by FASTCOPY.
- d. The JPL user system must be able to receive the files that will be sent by FASTCOPY.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.
- f. EOC, NOAA, and JPL must be able to make an assessment of product readability.
- g. EOSDIS (NISN) should be available for diagnostic support.

Test Stimulus

Stimulus

Source

- | | |
|---|----------------------|
| a. Test Condition forms with detailed test instructions
OR | EOC |
| b. Test information sheet forwarded to all parties. | NGN Test Director(s) |

Test Scenario/Description

- a. For the complete Data Readability test, PFM data will be used to simulate the two ADEOS-II downlinks at 60 MPS (X1) and 6 MPS (X3). An early version of this test, identified as MSTP Part I, Test (2) in the NASDA test framework, will be run using the Data Stripper simulated data generator, with a NASDA supplied configuration set. Files resulting from the early testing will be made available on 8mm tapes (prior to network connectivity).
- b. The ATS Controller will insure the 11m Data Path switch is configured to patch data from the 2 Sony ID1 recorders to the DS node. This may require a dummy ephemeris to insure the event is properly scheduled by the 11m system.
- c. The DS will perform frame synchronization and stripping on the two data streams, simultaneously, and will produce a complete set of L0 files.
- d. Upon completion of the stripping operation, the DSC will create a status file for the ATS Controller, from which the WFF Pass Results File will be generated.
- e. The DSC will monitor the DS operation, updating displays on the ATS Controller.
- f. The DSC will perform subsetting of the GLI-1K data in accordance with an RTIG MOIF file received from the ATS Controller.
- g. The DSC will produce status files for each L0 file requested in the LV0P MOIF file received from the ATS Controller.
- h. The LV0P-requested L0 and associated status files, in addition to the GLI-1K subset file, will be forwarded to the proper SAFS directories.
- i. SAFS will automatically distribute the files to NOAA and JPL, and email DRN messages to EOC for retrieval of their files.

- j. Upon completion of all operations, the DSC will create the L0RL file, and forward it to the ATS Controller, the TSI Q&A file will be forwarded to the ATS Controller (WFF only).
- k. When all customers have received their files, each will perform readability checks and report results back to the NGN.
- l. If this test is part of a MST, the NASDA supplied Test Procedure forms will be filled out by NGN and NASDA, respectively, and exchanged. NGN will complete internal test results forms in all test instances.

Expected Results for a Successful Test

- a. The DS/DSC stripping and file generation must be accomplished successfully.
- b. Status displays on the ATS Controller must be valid throughout the operation.
- c. The GLI-1K subsetting operation must be successfully accomplished, per the RTIG file.
- d. All L0 files requested in the LV0P file, and their associated status files must be forwarded to the SAFS. The GLI-1K subset file must be forwarded to the SAFS.
- e. The SAFS must successfully insure that all files are distributed to all NGN customers, including proper completion of the DRN/RCN procedure for EOC.
- f. Any error correction and/or notification procedures must perform properly, if needed.
- g. All summary files, including the L0RL file, must be generated and forwarded to the ATS Controller, as appropriate.
- h. All customers must verify receipt of a complete set of files, and must report successful processing of their files.
- i. Any discrepancies noted will have been resolved.

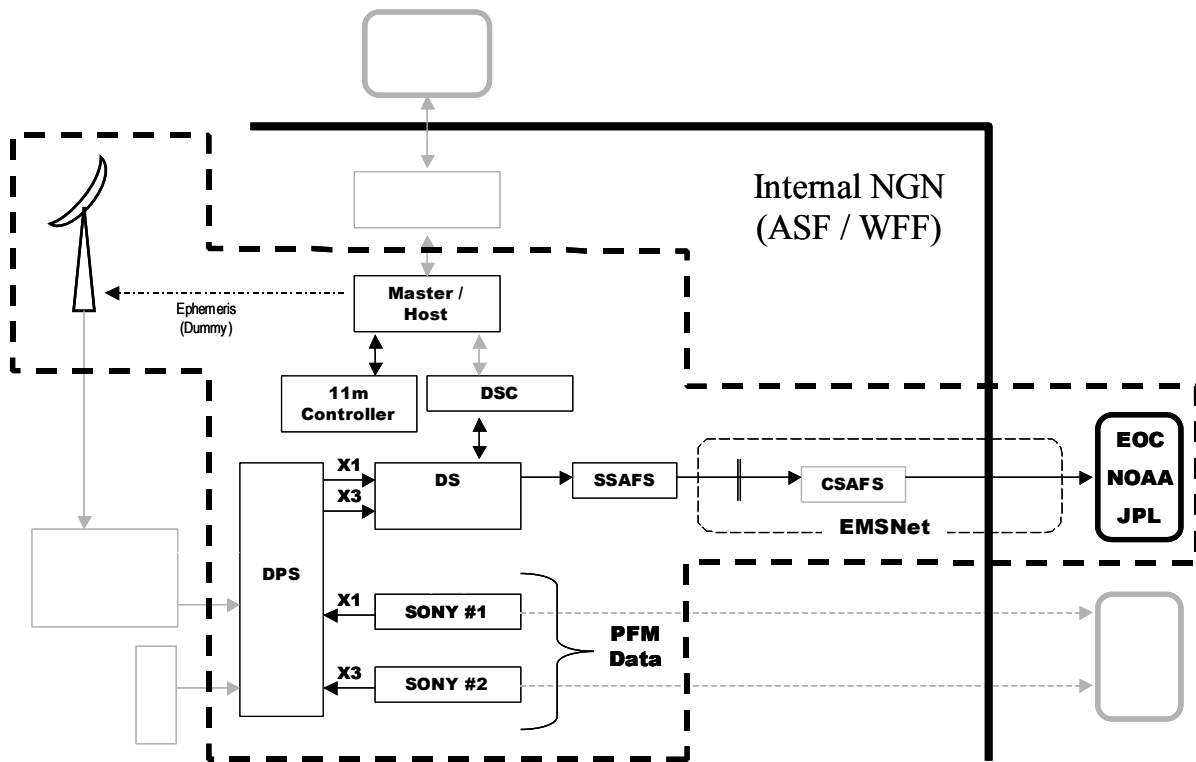


Figure 5.11 – Data Readability Test



5.12 Integrated Ground Station Test

Test Purpose

The purpose of the test is to demonstrate the ability of NGN Ground Stations to perform all functions (with the exception of satellite tracking) in support of ADEOS II.

Type of Test

☒ Engineering
☒ Operability
☒ Performance
☒ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☒ Collect reliability data
☒ Collect performance data
☒ Verify requirements are met
☒ Other: Confirm End-to-End operation of
 NGN GS

Facilities Involved

☒ ASF
☒ EOC
☒ NOAA
☒ SeaPac
☒ WFF
☒ CSAFS (GSFC)
☒ White Sands
☐ Other:

Ground System Elements

☒ Networks
☒ Scheduling
☒ L0 file generation
☒ Recording
☒ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

NASDA participation consists of the generation and processing of all MOIF according to a normal mission timeline. The NGN GS will produce all Level-0 files (according to the section of PFM data used in the test), and will record and mail a Sony D1 cassette with X1 data. NGN will generate and process their appropriate MOIF. NASDA should complete the test by returning the final MOIF, the RDRM.

Comments

This is the most comprehensive end-to-end test of the NGN GS for ADEOS II, simulating one or more complete ADEOS II supports.

Prerequisite

- a. Planning and scheduling operations must have been successfully completed.
- b. Operational network connections and bandwidths must be in place.
- c. All systems must be in working order at all sites.
- d. The NOAA & JPL user systems must be able to receive the files that will be sent by FASTCOPY.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.
- f. EOC, NOAA, and JPL must be able to make an assessment of product readability.
- g. EOSDIS (NISN) should be available for diagnostic support.

Test Stimulus

Stimulus

Source

- | | |
|---|----------------------|
| a. Test Condition forms with detailed test instructions
OR | EOC |
| b. Test information sheet forwarded to all parties. | NGN Test Director(s) |

Test Scenario/Description

- a. For the complete Integrated Ground Station test, PFM data will be used to simulate the two ADEOS-II downlinks at 60 MPS (X1) and 6 MPS (X3). The test is very similar to I&T 9 (Data Readability), differing in the respect that the MOIF planning, and scheduling files will be used on a normal mission timeline.
- b. The ATS Controller will insure the 11m Data Path switch is configured to patch data from the 2 Sony ID1 recorders to the DS node. This may require a dummy ephemeris to insure the event is properly scheduled by the 11m system.
- c. The DS will perform frame synchronization and stripping on the two data streams, simultaneously, and will produce a complete set of L0 files.
- d. Upon completion of the stripping operation, the DSC will create a status file for the ATS Controller, from which the WFF Pass Results File will be generated.
- e. The DSC will monitor the DS operation, updating displays on the ATS Controller.
- f. The DSC will perform subsetting of the GLI-1K data in accordance with an RTIG MOIF file received from the ATS Controller.
- g. The DSC will produce status files for each L0 file requested in the LV0P MOIF file received from the ATS Controller.

- h. The LV0P-requested L0 and associated status files, in addition to the GLI-1K subset file, will be forwarded to the proper SAFS directories.
- i. SAFS will automatically distribute the files to NOAA and JPL, and email DRN messages to EOC for retrieval of their files.
- j. Upon completion of all operations, the DSC will create the L0RL file, and forward it to the ATS Controller, and will forward the TSI Q&A file to the ATS Controller.
- k. When all customers have received their files, each will perform readability checks and report results back to the NGN.
- l. If this test is part of a MST, the NASDA supplied Test Procedure forms will be filled out by NGN and NASDA, respectively, and exchanged. NGN will complete internal test results forms in all test instances.

Expected Results for a Successful Test

- a. Planning and Scheduling operations, beginning 3 weeks prior to the test, must be properly completed.
- b. The schedule for each support should be correctly ingested into the ATS Controller, and properly passed to the 11m system, recording subsystem, and the DS node.
- c. The LV0P and RTIG files should be forwarded to the DSC.
- d. The ephemeris data for the support should correctly enable the 11m system to create the proper event. In the case of ephemeris for an actual S/C, the data should enable the 11m system to acquire the target, and transition from Program Track into Auto Track.
- e. The DS/DSC stripping and file generation must be accomplished successfully.
- f. Status displays on the ATS Controller must be valid throughout the support.
- g. The GLI-1K subsetting operation must be successfully accomplished, per the RTIG file.
- h. All L0 files requested in the LV0P file, and their associated status files must be forwarded to the SAFS. The GLI-1K subset file must be forwarded to the SAFS. The SAFS must successfully insure that all files are distributed to all NGN customers, including proper completion of the DRN/RCN procedure for EOC.
- i. Any error correction and/or notification procedures must perform properly, if needed.
- j. All summary files must be generated and forwarded to the ATS Controller, as appropriate. The L0RL file must be made available for EOC retrieval using the DRN/RCN procedure.
- k. All customers must verify receipt of a complete set of files, and must report successful processing of their files.

Any discrepancies noted will have been resolved.

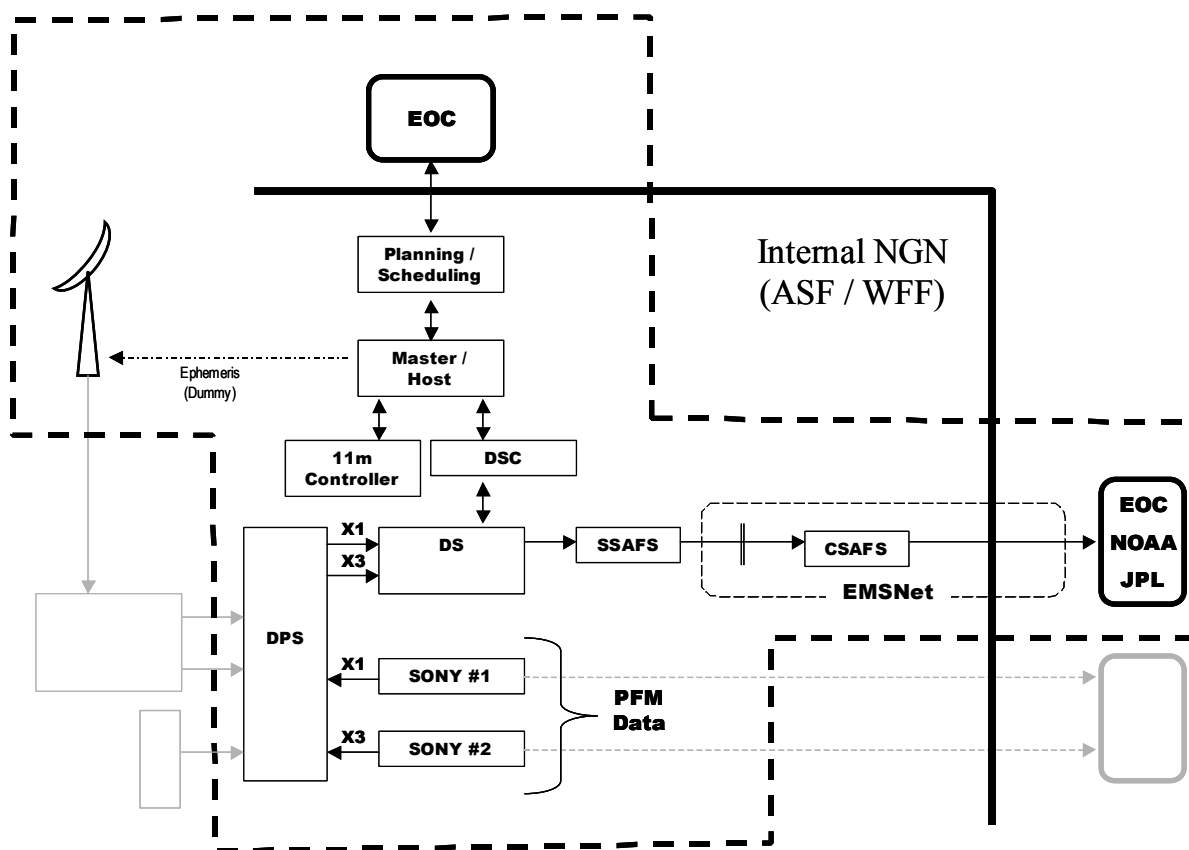


Figure 5.12 – Integrated GS Test



5.13 Anomaly Test

Test Purpose

Type of Test

☐ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☐ Verify requirements are met
☐ Other:

Facilities Involved

☐ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☐ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

Comments

Prerequisite (as applicable)

- a. Planning and scheduling operations must have been successfully completed.
- b. Operational network connections and bandwidths must be in place.
- c. All systems must be in working order at all sites.
- d. The NOAA & JPL user systems must be able to receive the files that will be sent by FASTCOPY.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.
- f. EOC, NOAA, and JPL must be able to make an assessment of product readability.
- g. EOSDIS (NISN) should be available for diagnostic support.

Test Stimulus**Stimulus**

- a. Test Condition forms with detailed test instructions
OR
- b. Test information sheet forwarded to all parties.

Source

EOC

NGN Test Director(s)

Test Scenario/Description**Scheduling Anomalies**

- a. DRN/RCN procedure
 - 1. Could not get file, due to network problem.
 - 2. Files retrieved with wrong size.
- b. Some files not received.
 - 1. MOIF: Received REQR, but never got SHAQ.
 - 2. Ephemeris: Not received as expected.
 - 3. No LV0P received, continue with default processing.

Reception Anomalies

- a. Tracking problems
 - 1. Never acquired spacecraft.
 - 2. Poor acquisition (sidelobe?).
 - 3. Poor BitSync Lock (acquisition status loss.
 - 4. Recovery

- b. Recovery during support
 - 1. Check RF input levels and lock indicators on the QPSKdemodulator & BSSC.
 - 2. Check Equipment Setups & Profiles
 - 3. Check Error & Message Logs.
 - 4. Change Time Bias & Scan parameters.
- c. Post Support, verify proper:
 - 1. Ephemeris
 - 2. Antenna Operation. Perform Automated Bore-Sight Test.
 - 3. Operation of all equipment.
- d. Recording problems
 - 1. Prime/Backup recorder malfunction.
 - 2. Record quality of low quality (% errors high).
- e. Identify recording anomaly during support
 - 1. Check for Tape Movement, & Front Panel indicators.
 - 2. Monitor Data Stripper Controller display for red indicators.
- f. Recovery Post Support
 - 1. If prime HDDR fails, ship backup tape.
 - 2. Determine cause of recorder failure.
 - 3. Verify entire data path quality, by running a RF long-loop BER test.

Test Scenario/Description (continued)

- g. Data Stripper Node
 - 1. Manual support required, due to one or more Master/Host alarms set.
 - 2. 6 Mbit Prime failover to 60/6 Mbit Secondary Data Striper.
 - 3. Data Stripper Rack failure.
- h. SAFS Node
 - 1. Failure to complete FASTCopy operation from ground station SAFS to Central SAFS.
 - 2. Failure to complete FASTCopy operation to customer Prime or Secondary.
 - 3. File transfer to SAFS not successful.
 - 4. Perform manual transfer.

Expected Results for a Successful Test

- a. All anomalies will have a procedure to identify the cause of the problem.
- b. Recovery procedures will be developed for each anomaly in order to bring the station back to full operation. These procedures are stored at each NGN ground station.
- c. A work-around may be necessary, until manufacturer repairs are completed.

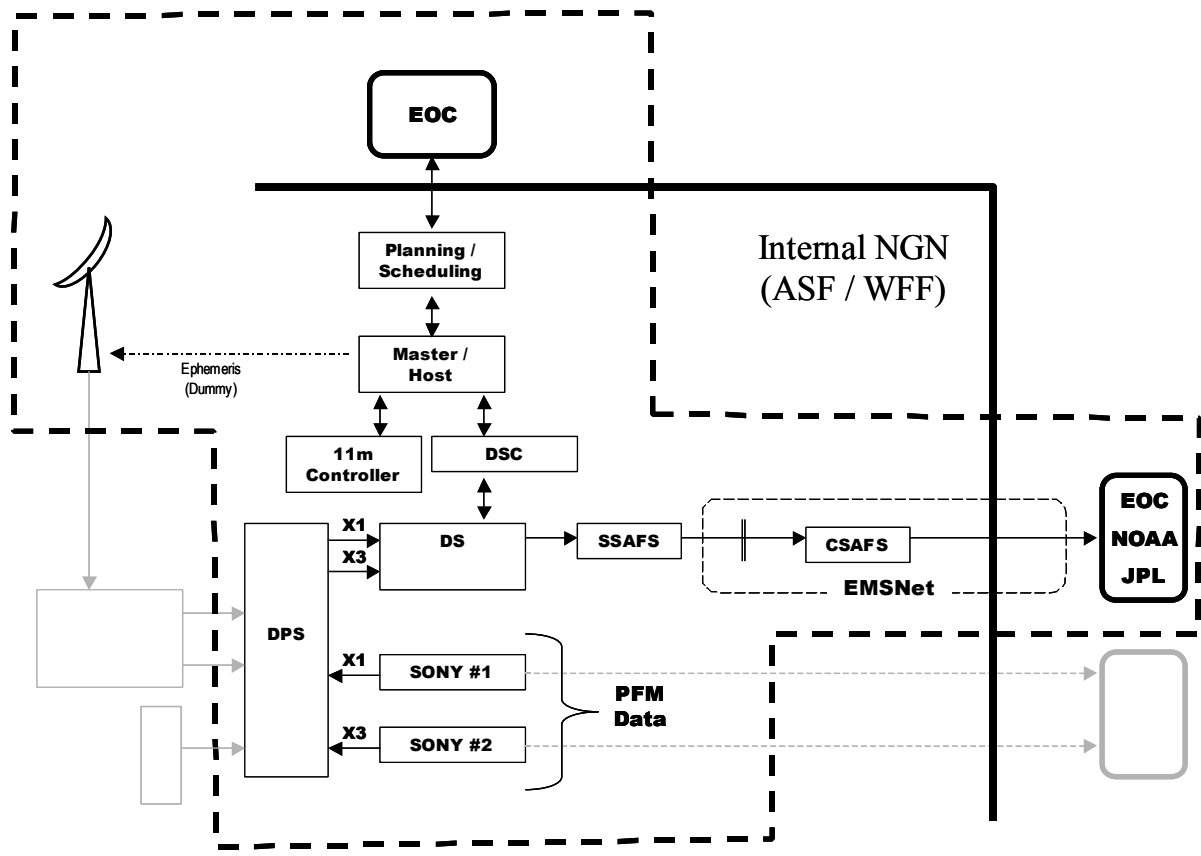


Figure 5.13 – Anomaly Testing



5.14 Proficiency Test

Test Purpose

Type of Test

☐ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☐ Verify requirements are met
☐ Other:

Facilities Involved

☐ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☐ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

Comments

Prerequisite (as applicable)

- a. Planning and scheduling operations must have been successfully completed.
- b. Operational network connections and bandwidths must be in place.
- c. All systems must be in working order at all sites.
- d. The NOAA & JPL user systems must be able to receive the files that will be sent by FASTCOPY.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.
- f. EOC, NOAA, and JPL must be able to make an assessment of product readability.
- g. EOSDIS (NISN) should be available for diagnostic support.

Test Stimulus**Stimulus****Source**

- | | |
|---|----------------------|
| a. Test Condition forms with detailed test instructions
OR | EOC |
| b. Test information sheet forwarded to all parties. | NGN Test Director(s) |

Test Scenario/Description

Proficiency exercises are used to train ground station personnel in nominal operations for ADEOS-II support.

- a. X-Band RF checks. Refer to Appendix B for detailed procedures.
 These can be performed without the dummy ADEOS-II spacecraft ephemeris, but should still be scheduled with the Wallops Scheduling Group (WSG). They should be performed monthly before launch, and as needed post launch.
 - 1. CTX-2: X-Band G/T Measurement. This is a good quality check of RF performance.
 - 2. PTX-2: X-Band Bit Error Rate (BER) Test with PN data. Checks X-band receiver and BSSC status.
- b. Data Processing Test (NGN Test #4). This is a good test of the DSC/DS operation, and can be performed short-looped.
- c. Integrated Ground Station Test (NGN Test #11) This test is a good simulation of an actual ADEOS-II support, and should be performed in a RF long-loop.

Expected Results for a Successful Test

See the Expected Results for a Successful Test section for the NGN test performed:

- a. Test #6: Telemetry Processing, X-Band RF Verification, Section 5.6.
- b. Test #4: Data Processing, Section 5.4.
- c. Test #11: Integrated Ground Station Test 5.11.
- d. Any error correction and/or notification procedures must perform properly, if needed.
- e. All summary files must be generated and forwarded to the Master Controller, as appropriate. The L0RL file must be made available for EOC retrieval using the DRN/RCN procedure.
- f. All customers must verify receipt of a complete set of files, and must report successful processing of their files.
- g. Any discrepancies noted will have been resolved.

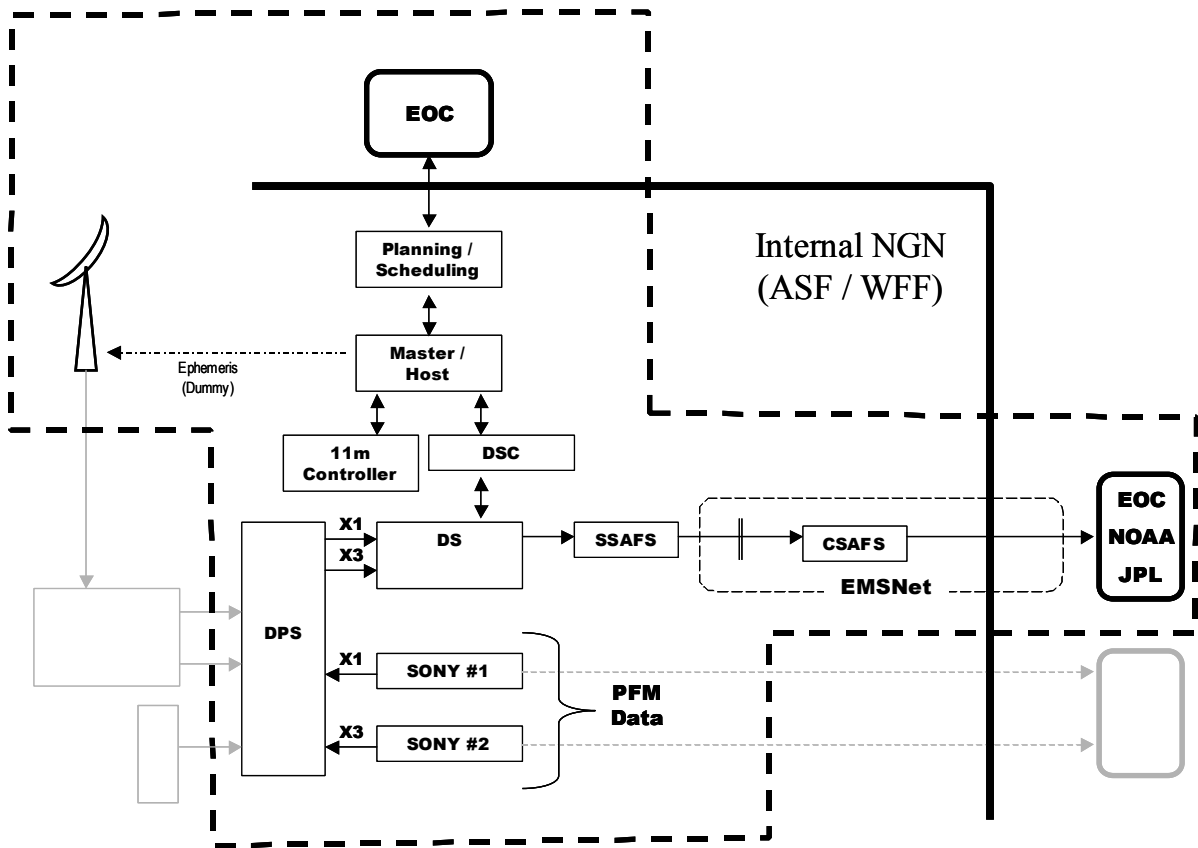


Figure 5.14 – Proficiency Testing



5.15 On-Orbit Test

Test Purpose

Type of Test

☐ Engineering
☐ Operability
☐ Performance
☐ Reliability
☐ Anomaly
☐ Other:

Test Objective

☐ Collect throughput data
☐ Collect reliability data
☐ Collect performance data
☐ Verify requirements are met
☐ Other:

Facilities Involved

☐ ASF
☐ EOC
☐ NOAA
☐ SeaPac
☐ WFF
☐ CSAFS (GSFC)
☐ White Sands
☐ Other:

Ground System Elements

☐ Networks
☐ Scheduling
☐ L0 file generation
☐ Recording
☐ Telemetry
☐ Tracking
☐ Other:

NASDA Participation

Comments

Prerequisite (as applicable)

- a. Planning and scheduling operations must have been successfully completed.
- b. Operational network connections and bandwidths must be in place.
- c. All systems must be in working order at all sites.
- d. The NOAA & JPL user systems must be able to receive the files that will be sent by FASTCOPY.
- e. The EOC DDS system must be able to process a DRN for each file type, retrieve the file, and generate the proper RCN upon successful completion of the FTP.
- f. EOC, NOAA, and JPL should be able to make an assessment of product readability.
- g. EOSDIS (NISN) should be available for diagnostic support.

Test Stimulus**Stimulus****Source**

- | | |
|---|----------------------|
| a. Test Condition forms with detailed test instructions
OR | EOC |
| b. Test information sheet forwarded to all parties. | NGN Test Director(s) |

Test Scenario/Description

- a. As soon as possible after launch, request EOC to turn on carrier for acquisition exercises.
 - 1. Determine time bias at the ground station.
 - 2. Optimize acquisition search pattern.
 - 3. Test ephemeris delivery during known “worst” case conditions.
- b. Schedule carrier tests on a regular basis for both AGS & WGS.
- c. When possible, downlink PN code.
 - 1. Exercise recording.
 - 2. Test bit synch acquisition.
 - 3. Check parameters for acquisition and recording.

Expected Results for a Successful Test (as applicable)

- a. Planning and scheduling operations, using informal FAX support request/confirmation form, must be properly completed.
- b. The schedule for each support should be correctly ingested into the ATS Controller, and properly passed to the 11m system, recording subsystem, and the DS node.
- c. The LV0P and RTIG files, if being used, should be forwarded to the DSC.

- d. The ephemeris data for the support should correctly enable the 11m system to create the proper event. In the case of ephemeris for an actual S/C, the data should enable the 11m system to acquire the target, and transition from Program Track into Auto Track.
- e. Any error correction and/or notification procedures must perform properly, if needed.
- f. Summary files must be generated and forwarded to the ATS Controller, as appropriate. The L0RL, RERC, & RERB files must be made available for EOC retrieval using the DRN/RCN procedure.
- g. All customers must verify receipt of a complete set of files, and must report successful processing of their files.
- h. Any discrepancies noted will have been resolved.

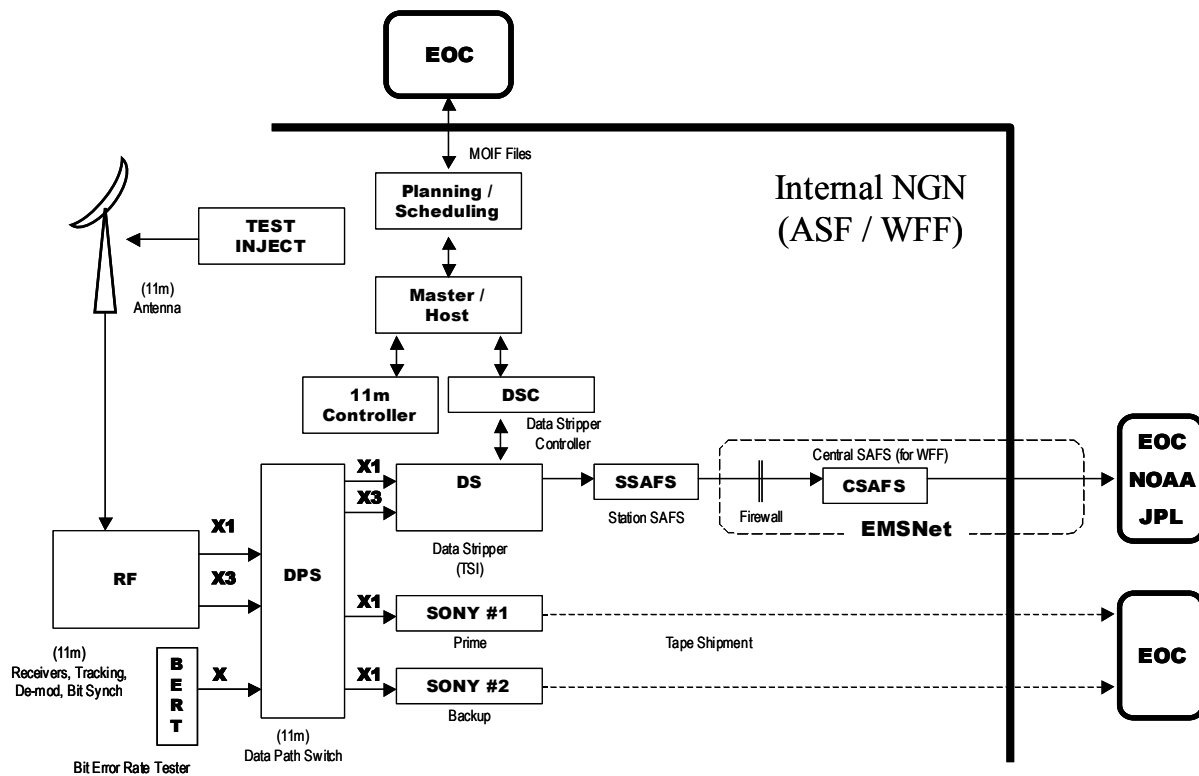


Figure 5.15 – On-Orbit Testing



6.0 Requirements Versus Test Matrix

This section contains the ADEOS-II NGN Requirements versus Test Matrix. Not all of the requirements are testable before launch; these will not appear in the columns for any I&T tests. Many of the requirements will be tested during Proficiency Testing, which will have some significant emphasis on anomaly processing. In referencing Table 6.0-1, the following designators are used:

- V Verified in test
- P Partially verified in test
- X Not verified in any test
- NA Not currently applicable

Table 6.0-1 – NGN Requirements versus Test Matrix

Requirements		Test Number														
Req #	Short Description	I&T #1	I&T #2	I&T #3	I&T #4	I&T #5	I&T #6	I&T #7	I&T #8	I&T #9	I&T #10	I&T #11	I&T #12	I&T #13	I&T #14	I&T #15
11010	DRN/RCN	V			V								V			
11020	Process REQR			V									V			
11030	Perform scheduling			P									V			
11040	Support 11 ASF & 4 WFF passes			X	X	X	X	X	X	X	X	X	X	X	X	
11050	Produce STGS			P									V			
11060	STGS timing												V			
11070	Retrieve STAD				V								V			
11080	Process ELMP			V									V			
11090	Process SHAQ												V			
11100	Process LV0P			P									V			
11110	Process RTIG			P									V			
11120	Forward LV0P & RTIG to DSC					V						V	V			
11130	Store MOIF scheduling files for 1 month			X	X	X	X	X	X	X	X	X	X	X	X	

Requirements		Test Number														
Req #	Short Description	I&T #1	I&T #2	I&T #3	I&T #4	I&T #5	I&T #6	I&T #7	I&T #8	I&T #9	I&T #10	I&T #11	I&T #12	I&T #13	I&T #14	I&T #15
11140	Act on anomalies													V	V	
11150	Backup for ASF scheduling			N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	
12100	Receive X-band data						V	V		V						
12110	Receive CCSDS data at 60 & 6 MBPS						V	V		V						
12120	Process raw signal data						V	V								
12130	Record Mode 1 data to Sony tape									V						
12140	Record Mode 2 data to Sony tape									V						
12150	Record primary & backup data to tape													V	V	
12160	Route raw signal data to DSC					V				V		V	V			
13100	Produce RERC & RERB after each support													V	V	
13110	Produce RERC for primary tape			P										V	V	
13120	Produce RERB for backup tape			P										V	V	
13130	Use MOIF interface for RERC/B retrieval				V									V	V	
13140	Bit Sync lock/unlock													V	V	
13150	Calculate time of Bit Sync lock													V	V	
13160	Calculate time of Bit Sync unlock													V	V	
13170	Calculate Acquisition Status %													V	V	
13180	Translate Acquisition Status to G,P,N													V	V	
13190	Calculate Recording Status													V	V	
13200	Produce PRFW file (WFF only)													V	V	
13210	Forward DS Q&A file to WOTIS (WFF only)					V						V	V			
13220	Retrieve summary recording results at all GS, if desired															
13230	Store acquisition report files for 1 month			X		X	X	X	X	X	X	X	X	X	X	
13240	Report GS anomalies													V	V	
13250	Anomaly report content													V	V	
13260	Report GS return to functionality													V	V	

Requirements		Test Number														
Req #	Short Description	I&T #1	I&T #2	I&T #3	I&T #4	I&T #5	I&T #6	I&T #7	I&T #8	I&T #9	I&T #10	I&T #11	I&T #12	I&T #13	I&T #14	I&T #15
13270	WFF report ASF acquisition results			N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	
21100	Process MRT L0 data											V	V			
21110	Process MDR L0 data											V	V			
21120	Process up to 5.5 GB of data per orbit			X	X	X	X	X	X	X	X	X	X	X	X	
21130	Produce Status file for each L0 data file					V						V	V			
21140	MDR data most important to process in case of failure													V	V	
21150	Subset GLI-1K data for NOAA per RTIG											V	V			
22100	Forward L0 files to SAFS quickly					V					V	V	V			
22110	Produce L0RL file			P		V						V	V			
22120	Make L0RL available for MOIF retrieval				P								V			
22130	Forward DS Q&A file to Master after pass (WFF only)					V						V	V			
22140	DSC report anomalies to GS via Master/HC													V	V	
22150	Act on L0 anomalies quickly													V	V	
31100	Ship primary Sony tapes 3 times/week								V							
31110	Produce SRRM			P									V			
31120	Make SRRM available for MOIF retrieval				P								V			
31130	Process tape readability (RDRM) from EOC												V			
31140	Ship backup tape if needed			X	X	X	X	X	X	X	X	X	X	X	X	
31150	If backup tape is shipped, produce SRRM			P										V	V	
31160	Use NASDA Sony tape labeling								V							
32100	Get VMS/DMS(1&2) out in 3 hrs if Mode 2 anomaly										V					
32110	Get VMS/DMS(1&2) out in 3 hrs if Mode 1 anomaly										V					
32120	Distribute 70% DCS MDR to NOAA in 3 hrs										V					
32130	Distribute 70% DCS MRT to NOAA in 3 hrs										V					
32140	Distribute ILAS in 5 hrs										V					
32150	Distribute HK to EOC & JPL in 100 mins										V					

Requirements		Test Number														
Req #	Short Description	I&T #1	I&T #2	I&T #3	I&T #4	I&T #5	I&T #6	I&T #7	I&T #8	I&T #9	I&T #10	I&T #11	I&T #12	I&T #13	I&T #14	I&T #15
32160	Distribute SeaWinds to NOAA in 150 mins										V					
32170	Deliver SeaWinds L0 & HK to JPL										V					
32180	Deliver MDR & MRT products to NOAA on T1 interface										V					
32190	Deliver products to NASDA in Mode 2										V					
32200	SAFS support of DRN/RCN protocol										V	V	V			
41100	NGN store tapes			X	X	X	X	X	X	X	X	X	X	X	X	
41110	NGN erase tapes on RDRM or 30 days			X	X	X	X	X	X	X	X	X	X	X	X	
41120	NASDA furnish primary Sony tapes			X	X	X	X	X	X	X	X	X	X	X	X	
41130	NASA furnish backup Sony tapes			X	X	X	X	X	X	X	X	X	X	X	X	
42100	SAFS archive all files for 96 hours											V	V	V	V	
42110	SAFS delete files after 96 hours											V	V	V	V	
51100	NGN support MSTP, Part I			V												
51110	NGN support MSTP, Part II											V				
51120	NGN support MSTP, Part III												V			
51130	NGN support MSTP, Part IV (if request)			X	X	X	X	X	X	X	X	X	X	X	X	
52100	NGN support Proficiency Testing													V	V	

Appendix A - List of Acronyms

ADEOS-II	Advanced Earth Observing Satellite - II
AMSR	Advanced Microwave Scanning Radiometer
APS	Acquisition Planning Subsystem at ASF
ASF	Alaska SAR Facility
ATS	Automated Tracking Station
ATS Controller	ATS station controller at WFF
CCSDS	Consultative Committee for Space Data Systems
CDS	Comprehensive Discrepancy System
CNES	Centre National d'Etudes Spatiales
CSOC	Consolidated Space Operations Contract
DCS	Data Collection System
DFG	Data File Generator (for simulated DS files used in n-Day Test)
DMS	Dynamics Monitoring System
DRN	Data Ready Notification, used in the NASDA/NGN file transfer protocol
DS	ADEOS-II Data Stripper
DSC	Data Stripper Controller
DSN	Data Stripper Node consisting of an ADEOS-II DS and DSC
EA	Environmental Agency of Japan
ELMP	ADEOS-II MOIF scheduling file, containing one day of predicted ephemeris (position/velocity) for the spacecraft
EOC	Earth Observation Center
EOIS	Earth Observation Data and Information System
EODIS	Earth Observing System Data and Information System
EPHM	ADEOS-II scheduling file, designated EP20#, with S/C position and velocity vectors used to acquire the downlink signal.
ESDIS	Earth Science Data and Information System
FAIF	Flight Agency Interface Function at ASF
FAX	Facsimile Message
GLI	Global Imager
GPS	Global Positioning Satellite
GS	Ground Station (where S/C data are received)
GSFC	Goddard Space Flight Center
HC	Host Controller (Station Controller at ASF)
HK	Housekeeping (data)
ILAS-II	Improved Limb Atmospheric Spectrometer-II
IRD	Interface Requirements Document
JPL	Jet Propulsion Laboratory
LV0P	ADEOS-II scheduling file directing DSN to deliver certain level-0

	data files to designated customers
MDR	Mission Data Recorder
MOIF	Mission Operation Information Files
MOIP	Mission Operations Implementation Plan
MOU	Memorandum Of Understanding
MRT	Multiplexed Real-Time
NASA	National Aeronautics And Space Administration
NASDA	National Space Development Agency
NESDIS	National Environmental Satellite, Data, and Information Service
NGN	NASA/NOAA Ground Network
NOAA	National Oceanic and Atmospheric Administration
ODR	Optical Data Recorder on ADEOS-II spacecraft
PFM	Proto-Flight Model
PO.DAAC	Physical Oceanography Distributed Active Archive Center
RCN	Receipt Confirmation Notification, used in the NASDA/NGN file transfer protocol
RDRM	ADEOS-II MOIF file, sent from NASDA to NGN, containing the readability status of tapes conveyed via the SRRM
REQR	ADEOS-II MOIF scheduling file used to convey initial downlink schedule to NGN
RERC/B	ADEOS-II MOIF file, generated after every support, used to summarize the results of the downlink (RERC for primary, RERB for backup)
RTIG	ADEOS-II scheduling file used by DSN to determine which NOAA areas should be subset from a GLI-1K level-0 data file
S/C	Spacecraft
SAFS	Standard Autonomous File Server
SeaPAC	SeaWinds Processing and Analysis Center
SeaWinds	NASA-JPL Scatterometer On ADEOS-II
SHAQ	ADEOS-II MOIF scheduling file, received one week before support week, used to refine REQR support requirements.
SIF	WGS Shipment Information File, sent from the ATS Master to WOTIS, used to convey tape shipment information
SRRM	ADEOS-II MOIF file, containing tape shipment information, forwarded to NASDA each time tapes are mailed
STAD	ADEOS-II MOIF file used to inform NGN of a spacecraft anomaly or a routine orbit adjust
STGS	ADEOS-II MOIF scheduling file used to inform NASDA of supports which cannot be accommodated at an NGN GS
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
UAF	University of Alaska at Fairbanks
UHF	Ultra High Frequency
VMS	Visual Monitoring System
WFF	Wallops Flight Facility

WGS	Wallops Ground Station
WISAC	Wallops Orbital Tracking Information System Access
WISDB	Wallops Orbital Tracking Information System Database
WOTIS	Wallops Orbital Tracking Information System
WOTRS	Wallops Orbital Tracking Resource Scheduler

Appendix B – ADEOS-II X-Band RF Verification Procedure

1. General

The ADEOS-II X-Band RF Verification Procedure outlines a checkout of the EOS Ground System* (EGS) ground station equipment (GSE). The testing for ADEOS-II will be performed in a similar fashion. The X-Band 11-Meter system will be tested.

2. Test Description

The ADEOS-II spacecraft will be simulated using spacecraft PFM telemetry on a SONY tape, which will be played back on a SONY tape recorder, sent into the X-Band test modulator, and then upconverted at the X-Band Test Inject upconverter.

Using PN data from an Anritsu Bit Error Rate Transmitter will provide ADEOS-II BER Data, transmitted at X-Band.

3. Test Equipment

The following equipment will be used to simulate the ADEOS-II spacecraft:

6 & 60 Mbps Clock Source (WaveTEK 2405 Synthesized Signal Generator)
BER Transmitter (Anritsu Digital Transmission Analyzer ME520B)
QPSK Test Modulator (375 MHz Tx) (SA 924-6)
375 MHz to X-Band Up Converter

Figure 1 follows and shows the above equipment, and the configuration of the ground station under test for ADEOS-II.

*The EGS consists of the Alaska Ground Station (AGS), the McMurdo Ground Station (MGS), the Svalbard Ground Station (SGS), and the Wallops Ground Station (WGS).

4. Test Outline

ADEOS-II X-Band RF Verification Procedure

5. X-Band Telemetry Calibration Tests

- CTX-1. X-Band Line Loss Measurement
- CTX-2. X-Band G/T Measurement
- CTX-3. X-Band C/N_0 Measurement
- CTX-4. X-Band Receiver CW Threshold

6. X-Band Telemetry Performance Tests

- PTX-1. ADEOS-II X-Band BSSC Telemetry Threshold
- PTX-2. Bit Error Rate (BER) with PN data

7. Summary of Results

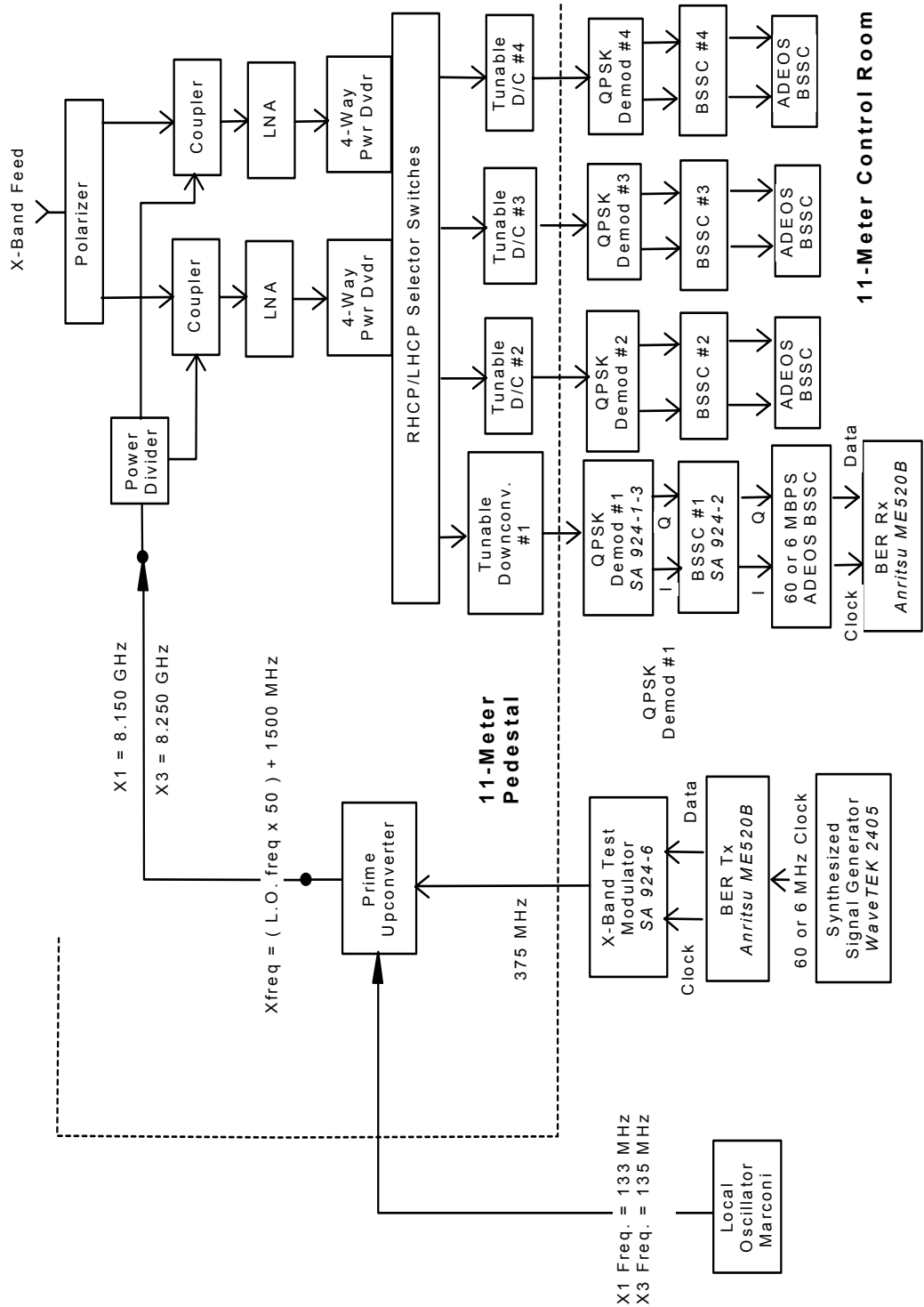


Figure 1: ADEOS II Wallops Ground Station (WGS) X-Band Test Configuration

ADII_WGS.cfi

5. X-Band Telemetry

Table 1. Test Modes

Telemetry Mode	Downlink Frequency (MHz)	Data Rates	
		I Channel (Mbps)	Q Channel (Mbps)
X1-60	8150.0	30	30
X3-6	8250.0	3	3

Table 2. Calibration Tests

Telemetry Tests	Test Title	Telemetry Mode	
		X1 CW	X1 CW
CTX-1	X-Band Line Loss Measurement	X	X
CTX-2	X-Band G/T Measurement	X	X
CTX-3	X-Band C/N ₀ Measurement	X	X
CTX-4	X-Band Receiver CW Threshold	X	X

Table 3. Performance Tests

Telemetry Tests	Test Title	Telemetry Mode	
		X1 - 60	X1 - 6
PTX-1	ADEOS-II BSSC Telemetry Threshold	X	X
PTX-2	Bit Error Rate (BER) with PN data	X	X

PN = BER PN Code on transmitter channel under test.
 PN/PN = PN on both I ($2^{15} - 1$) & Q ($2^{23} - 1$) channels.

5. X-Band Telemetry Calibration Tests

CTX-1. X-Band Line Loss Measurement

Purpose: Measure the line losses for the two X-Band downlinks frequencies from the test modulator.

Procedure:

1. Using a power meter with a low power sensor, measure the coupling factor on a directional coupler. Put the directional coupler at the input to the “X-Band Test” port at the “Antenna Interface Panel” (AIP), after the diplexer and attenuator.
2. Provide loss(es) from “X-Band Test” port (AIP input) to the test inject port, which is the input to the first stage LNA’s.

Telemetry Mode	Frequency (MHz)	Loss (dB)	Coupling Factor (dB)
		AIP to Test Inject LNA Input	Power Meter to Test Inject LNA Input
X1 - CW	8150	34	
X3 - CW	8250	34	

CTX-2. X-Band G/T Measurement

Purpose: Measure the G/T for the X-Band receiver inputs.

Procedure: The automated X-Band procedures described in the SA manual*.

Telemetry Mode	Frequency (MHz)	X-Band LNA	Tx @Input to LNA	G/T	G	T, System Temperature		LNA Equiv. N_0^{**}
			dBm	dB	dB	dB °K	°K	dBm/Hz
X1 - CW	8150	LHC						
		RHC						
X3 - CW	8250	LHC						
		RHC						

*Alaska Radarsat Station Control Computer (SCC), Software User’s Guide
(Scientific Atlanta: Pub. No. 55F504Z, Manual No. 529076). Pp. 3-107 – 111.

**LNA Equiv. $N_0 = T - 198.6$

CTX-3. X-Band C/N_0 Measurement

Purpose: Measure the C/N_0 at the X-Band receiver inputs.

Procedure:

1. Turn on unmodulated carrier (CW=carrier wave) signal at a nominal level) into the X-Band receiver. Measure Tx @ Input to LNA.
2. Measure the carrier power (C), the noise spectral density (N_0), using a spectrum analyzer at the input of the receiver.*
Calculate C/N_0 , LNA Equivalent N_0 ($T_x - C/N_0$), and System Temperature (T) (LNA Eq. $N_0 + 198.6$)

Telemetry Mode	Frequency (MHz)	X-Band LNA	Tx @Input to LNA	C/ N_0	LNA Equiv. N_0	T, System Temperature	
			dBm	dB-Hz	dBm/Hz	dB °K	°K
X1 - CW	8150	LHC					
		RHC					
X3 - CW	8250	LHC					
		RHC					

CTX-4. X-Band Receiver CW Threshold

Purpose: Measure the CW X-Band station receiver threshold.

Procedure:

1. Provide the CW signal at center frequency, using the X-Band Test Modulator.
2. Decrease the signal until LOS.
3. Increase the signal for AOS.
4. Monitor and record the S-Band receiver for LOS & AOS.

Telemetry		X-Band				AOS (dBm)	LOS (dBm)
Mode	Source	Frequency (MHz)	LNA	Down Converter	QPSK Demod		
X1 - CW	Test Modulator	8150	LHC				
			RHC				
X3 - CW	Test Modulator	8250	LHC				
			RHC				

* C/N_0 Measurement, using HP 8563E Spectrum Analyzer

Use Multicoupler Test Points (i.e. Receiver Input).

Set **FREQUENCY** for center frequency 375 MHz.

Set **SPAN** to 200 kHz.

Bring **AMPLITUDE** up, by adjusting REF Level for maximum signal display.

Select **MKR**, **Marker Normal**, **SIG TRK ON**.

Select **Marker Delta**, **SIG TRK OFF**.

Select **TRACE, VID AVG ON.**
 Select **MKR, Marker Delta, 30 kHz, MKR NOISE ON.**

6. X-Band Telemetry Performance Tests

PTX-1. ADEOS-II X-Band BSSC Telemetry Threshold

Purpose: Measure the X-Band station receiver threshold at the Bit Synchronizer & Signal Conditioner (BSSC).

Procedure:

1. Provide the modulated telemetry signal at center frequency. Use two PN BER Transmitters for the I&Q channels, feeding the QPSK Test Modulator, and X-Band upconverter.
2. Decrease the signal until BSSC LOS.
3. Increase the signal for BSSC AOS.
4. Monitor and report the ADEOS-II BSSC for LOS & AOS levels.
Record AOS & LOS signal levels.

Telemetry Mode	Data Rate (Mbps)	X-Band LNA	BSSC LOS (dBm)	BSSC AOS (dBm)
X1	60	RHC		
X3	6			

6. X-Band Telemetry Performance Tests

PTX-2. Bit Error Rate (BER) with PN data

Purpose: Find the Bit Error Rate curve for each telemetry mode.

Procedure:

1. Provide the simulated (PN) telemetry data specified by the telemetry mode to the transponder.
2. Reduce the telemetry signal strength in 1 dB steps near bit synchronizer thresholds to obtain a BER curve.
3. Monitor and report bit error rates at each signal level per CTV request.
4. Record bit error rates at each signal level.

Telemetry Mode	Frequency (MHz)	LNA	Power Monitor (dBm)	LNA Input (dBm)	C/N ₀ (dB-Hz)	E _B /N ₀ * (dB)	Bit Error Rates
X1-60	8150	LHC					
		RHC					

*E_B/N₀ = C/N₀ + Mod. Loss Composite - 10 log (Bit Rate)

6. X-Band Telemetry Performance Tests

PTX-2. Bit Error Rate (BER) with PN data

Telemetry Mode	Frequency (MHz)	LNA	Power Monitor (dBm)	LNA Input (dBm)	C/N ₀ (dB-Hz)	E _B /N ₀ * (dB)	Bit Error Rates
X3-6	8250	LHC					
		RHC					

$$*E_B/N_0 = C/N_0 + \text{Mod. Loss}_{\text{Composite}} - 10 \log (\text{Bit Rate})$$

7.0 Summary of Results